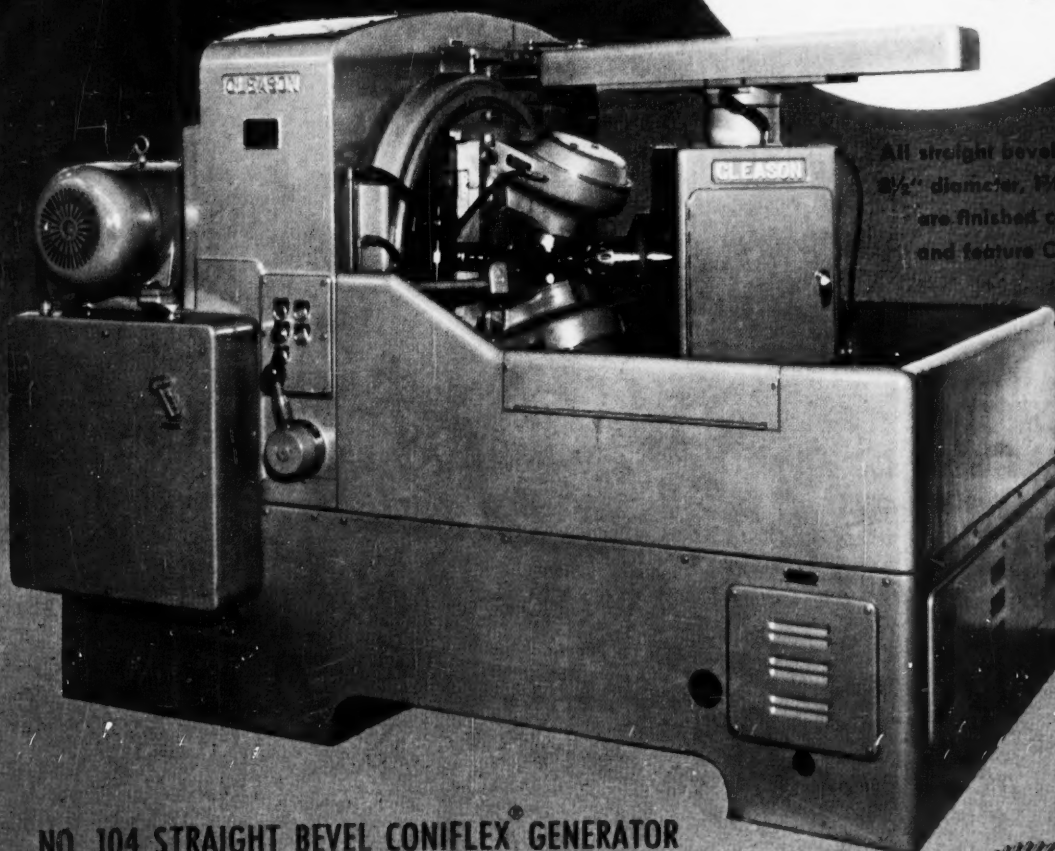
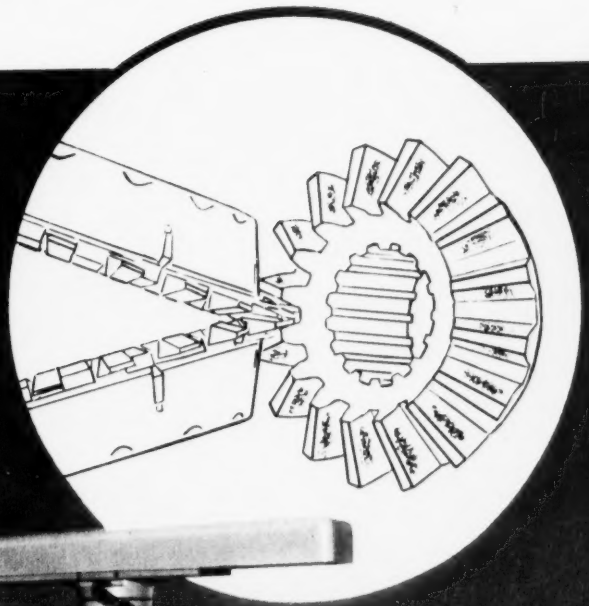


SEPTEMBER 1953—SIXTIETH YEAR

# MACHINERY

*New!*



All straight bevel gears up to 3 D. P.,  
8 1/2" diameter, 14" face, 10 to 1 ratio  
are finished cut from the solid  
and feature CONIFLEX® teeth.

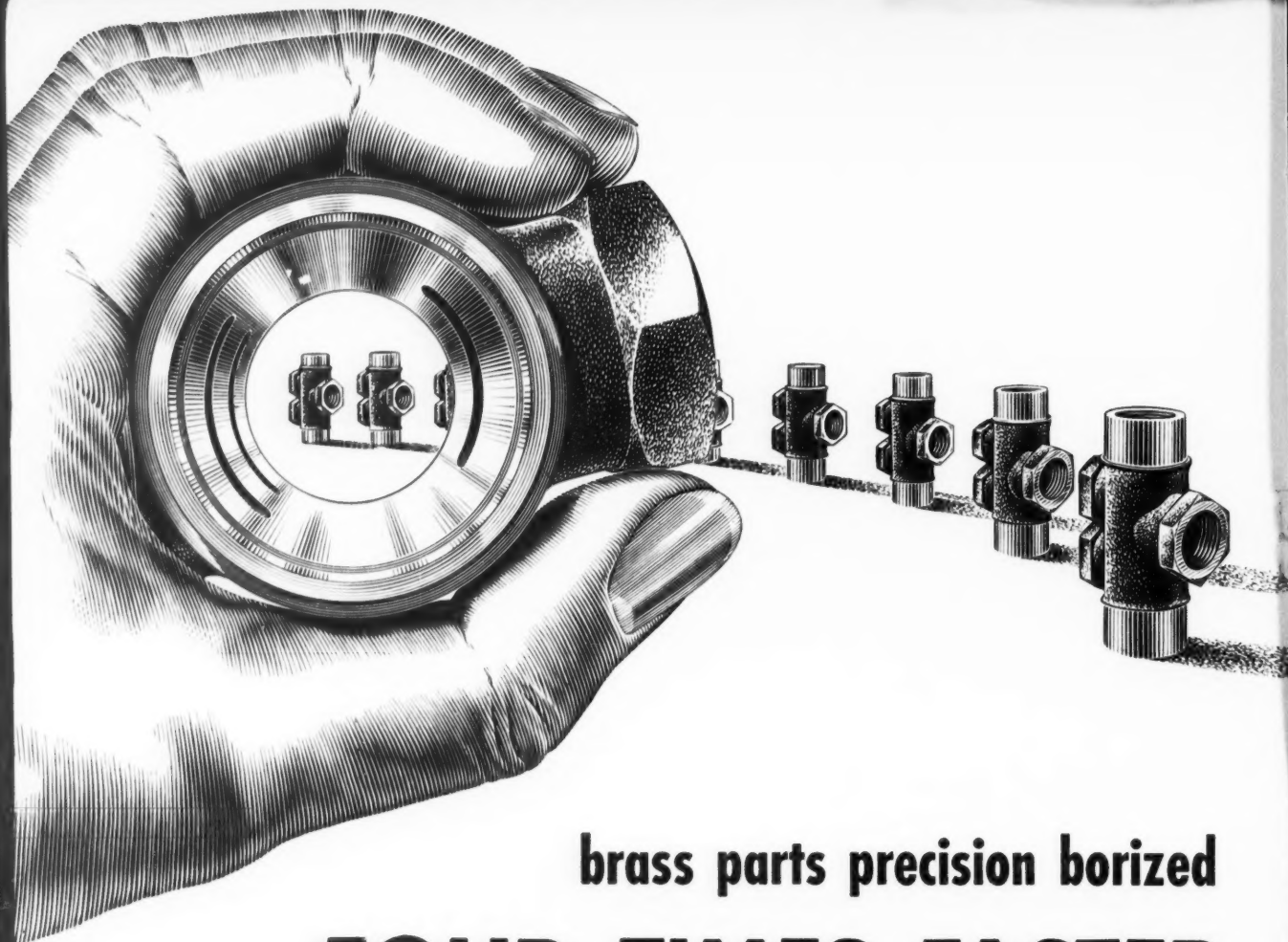
NO. 104 STRAIGHT BEVEL CONIFLEX® GENERATOR

**GLEASON WORKS**

Rochester 3, New York, U. S. A.







brass parts precision borized

# FOUR TIMES FASTER

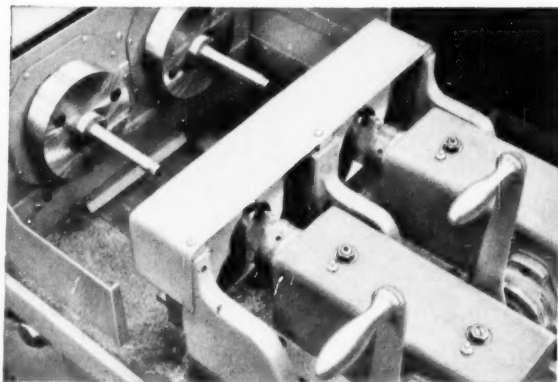
*... with higher accuracy and better finish, too!*

- No wonder this Heald customer is pleased.

Compared to the method previously used, his new Bore-Matic has multiplied air-valve production *four times!*

This one machine, a Model 124 Bore-Matic, finishes 15 different sizes and types of valve bodies. What's more, borizing of the rough-reamed parts produces a bore that's straight, round and within .0002" for size. Scrap losses have dropped to the vanishing point. And the new machine is far easier to operate, requiring less operator training.

*Remember—when it comes to precision finishing, it pays to come to Heald.*



Internal and Rotary  
Surface Grinding Machines  
and Bore-Matics



**THE HEALD MACHINE COMPANY**

WORCESTER 6, MASSACHUSETTS

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Circulation Offices  
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148 Lafayette St., New York 13, N.Y.

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**NORMAN O. WYNKOOP, Jr.**  
17597 James Couzens Highway  
Detroit 33, Mich.

**DON HARWAY & COMPANY**  
1709 W. Eighth St., Los Angeles 17, Calif.

MACHINERY, published monthly by The  
Industrial Press, Emmett St., Bristol,  
Conn. Executive offices 148 Lafayette  
St., New York 13, N. Y.

Subscription Rates: United States and  
Canada, one year, \$4; two years, \$7;  
three years, \$8; foreign countries, one  
year, \$7; two years, \$13. Single copies,  
40 cents. Changes in address must be  
received by the fifteenth of the month  
to be effective for the next issue. Send  
old as well as new address. Copyright  
1953 by The Industrial Press.

Entered as second-class mail matter  
May 25, 1953, at the Post Office at  
Bristol, Conn., under the Act of March 3,  
1879. Printed in the United States of  
America.

British Address  
National House, West St.  
Brighton 1, England

French Address  
15, Rue Bleue  
Paris-IX\*, France



# MACHINERY

VOLUME 60

SEPTEMBER, 1953

NUMBER 1

**The Monthly Magazine of Engineering and Production  
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# **A NEW** *for Cutting Large*

• **HARDENED** and  
**60%**



**LANDIS Machine CO.**

WORLD'S LARGEST MANUFACTURERS OF THREAD



# LANDMACO

## *Diameter Threads—*

GROUND WAYS • WIDE SPEED RANGE  
MORE GRIPPING POWER • 6" CAPACITY

● A New LANDMACO Threading Machine with many improvements and new design features has been developed for heavy-duty precision threading on large diameter work. The first installation of this new LANDMACO is shown threading "Unbrako" socket head screws of TS4140 steel at the Standard Pressed Steel Company, Jenkintown, Pa. 1½" diameter 12 pitch UN threads are being cut 2 29/32" long to a Class 3 fit.

The carriage front, based on a new principle, assures proper work alignment under gripping pressure and gives 60% more gripping efficiency. Heavy hardened and ground rectangular ways firmly guide and support the carriage.

A single gear shift lever is provided for a rapid speed change of 25% for any given spindle speed as determined by the speed change gears in use. Three pairs

of speed change gears provide twelve spindle speeds ranging from 9 to 152 revolutions per minute.

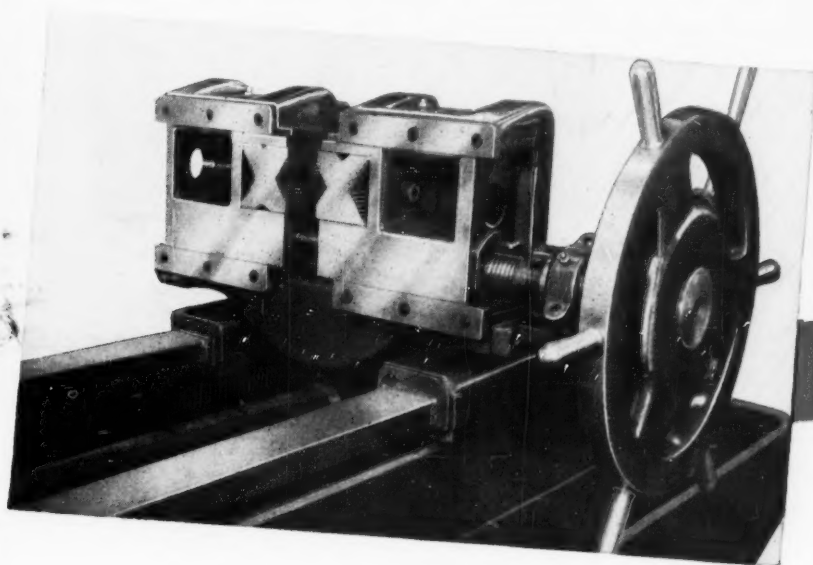
This machine is equipped with either the 4" Standard Rotary Head or the new 6" (6-chaser) Lanco Head. It will cut bolt threads from 1½" to 6⅝" in diameter, and pipe threads from 1" to 6" in diameter. Maximum thread length is 29" with leadscrew and 30" without leadscrew.

For more complete information on this new LAND MACO Threading Machine, write for Bulletin #H-45.

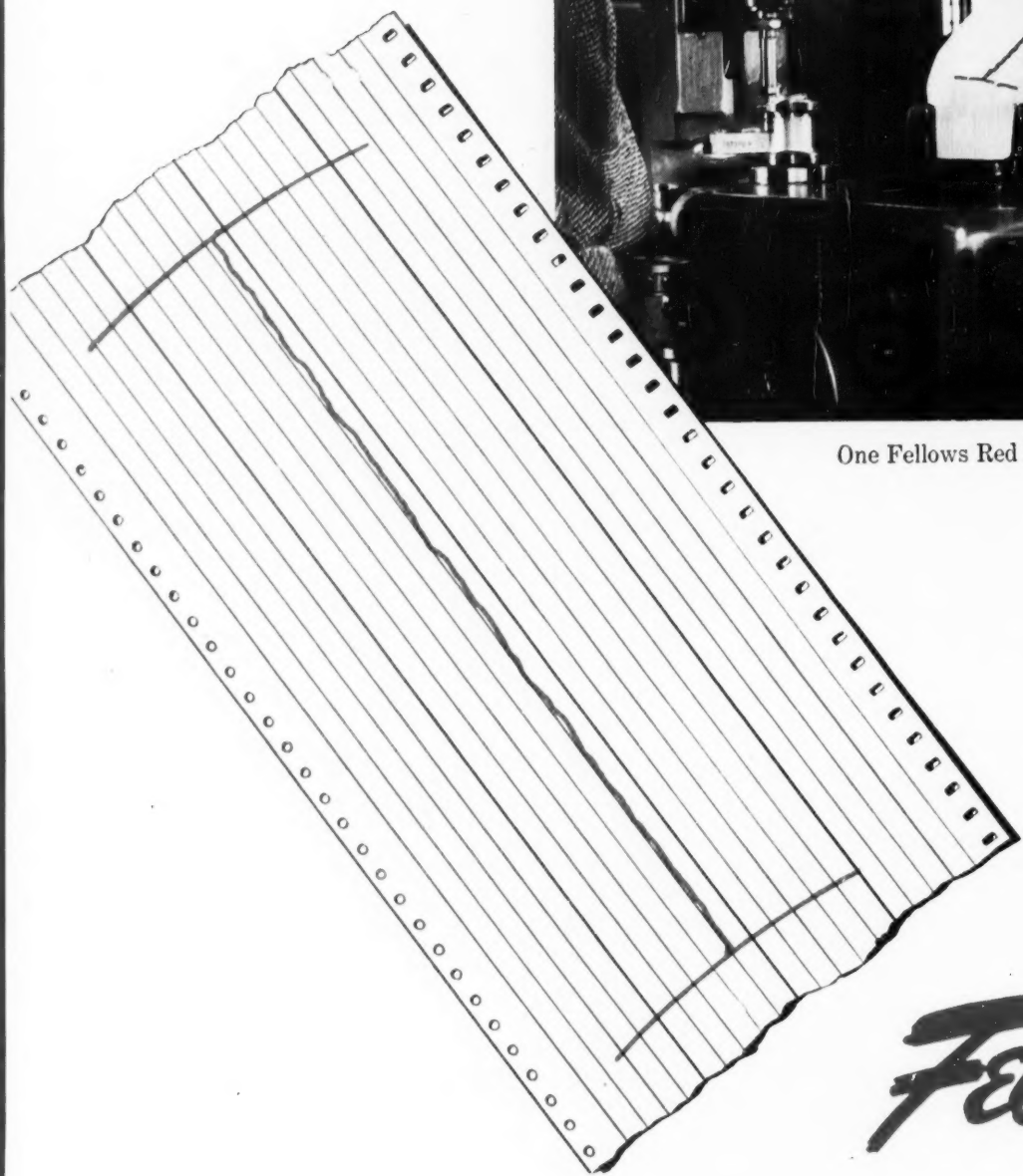
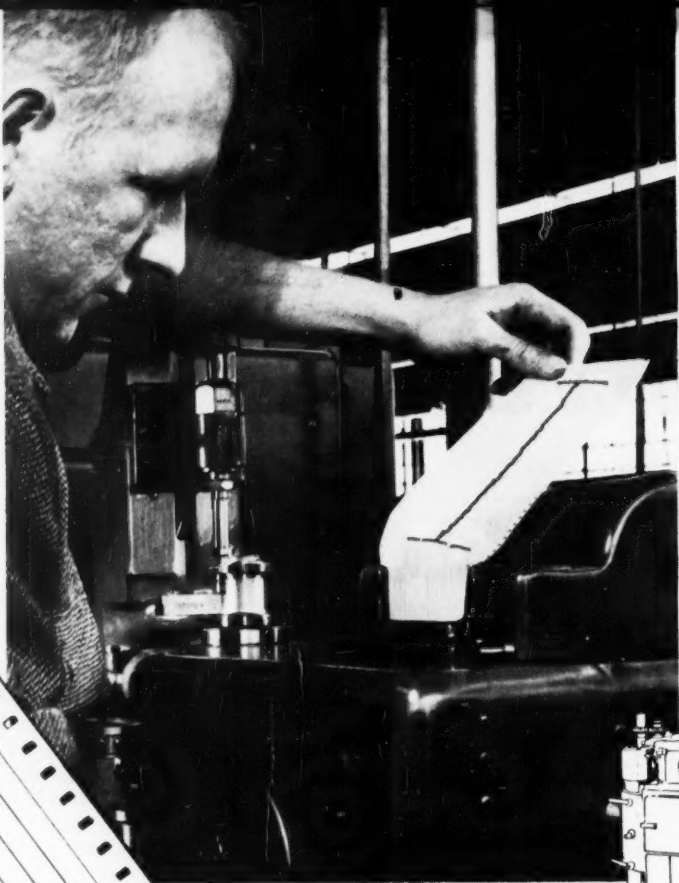


WAYNESBORO  
PENNSYLVANIA

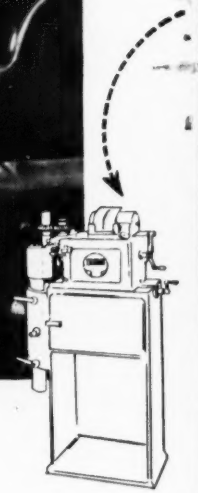
GENERATING EQUIPMENT



The FELLOWS METHOD  
*...in action!*



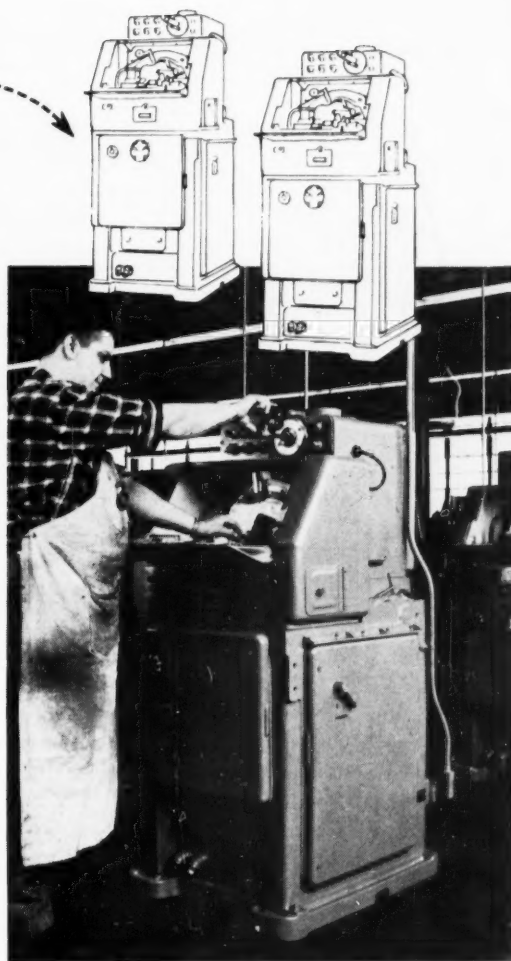
One Fellows Red Liner...



*Fellows*

## A Sure Combination to

## Mass Produce Gear ACCURACY



... to each pair of Fellows Shavers

Using one Red Liner with each pair of Fellows Gear Shavers has proved both practical and economical for the Arma Corporation.

Here's why . . . Arma makes basic weapon and missile control systems as well as navigational systems and remote precision control devices for the military and for industry and commerce. Hence the need for exceptional gear accuracy and for safeguards against excessive pitch line runout.

Fellows Shavers *create* that accuracy, and Fellows Red Liners *guard* it (by providing a permanent charted record of the "composite check" of each gear for quality control).

With this fast working and easy to operate Fellows combination, Arma increases production and makes wiser use of manpower.

This is a typical example of the Fellows Method in action. Why not call in a Fellows Representative and hear the details. They are interesting from *many* viewpoints.

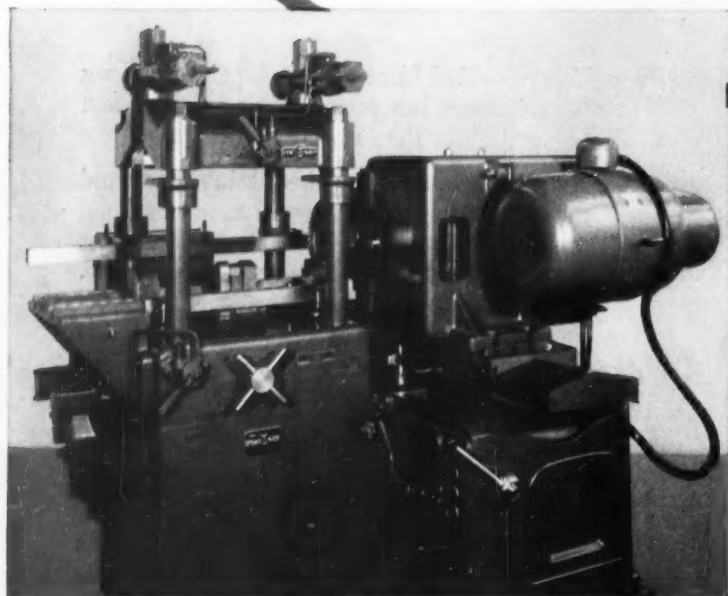
### GEAR SHAPER COMPANY

*Head Office & Export Department:* 78 River Street, Springfield, Vermont.

*Branch Offices:* 323 Fisher Building, Detroit 2 • 5835 West North Ave., Chicago 39.  
2206 Empire State Building, New York 1.



# Hydromatic Bed and Dial Type Head Combine Forces to Mill Cylinder Blocks

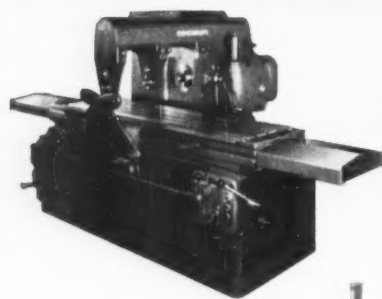


Familiar units comprise this CINCINNATI special purpose miller. In this view, a cylinder block is clamped in position for the milling operation.

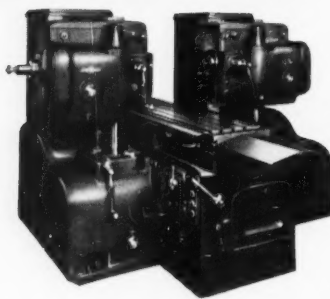
Operator's working station, showing comparative simplicity of Hydromatic and Dial Type combination.

## PRODUCTION DATA

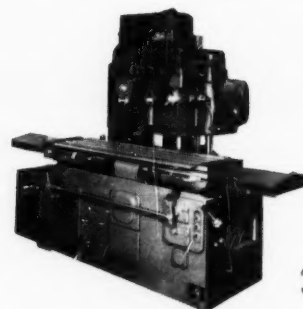
|                    |  |
|--------------------|--|
| Part Name.....     | Cylinder block                                   |
| Material.....      | Cast iron  |
| Operation.....     | Mill flywheel end square with crankshaft bearing |
| Cutting Speed..... | 300 feet per minute                              |
| Feed.....          | 25" per minute                                   |
| Production.....    | 30 per hour                                      |



1



2



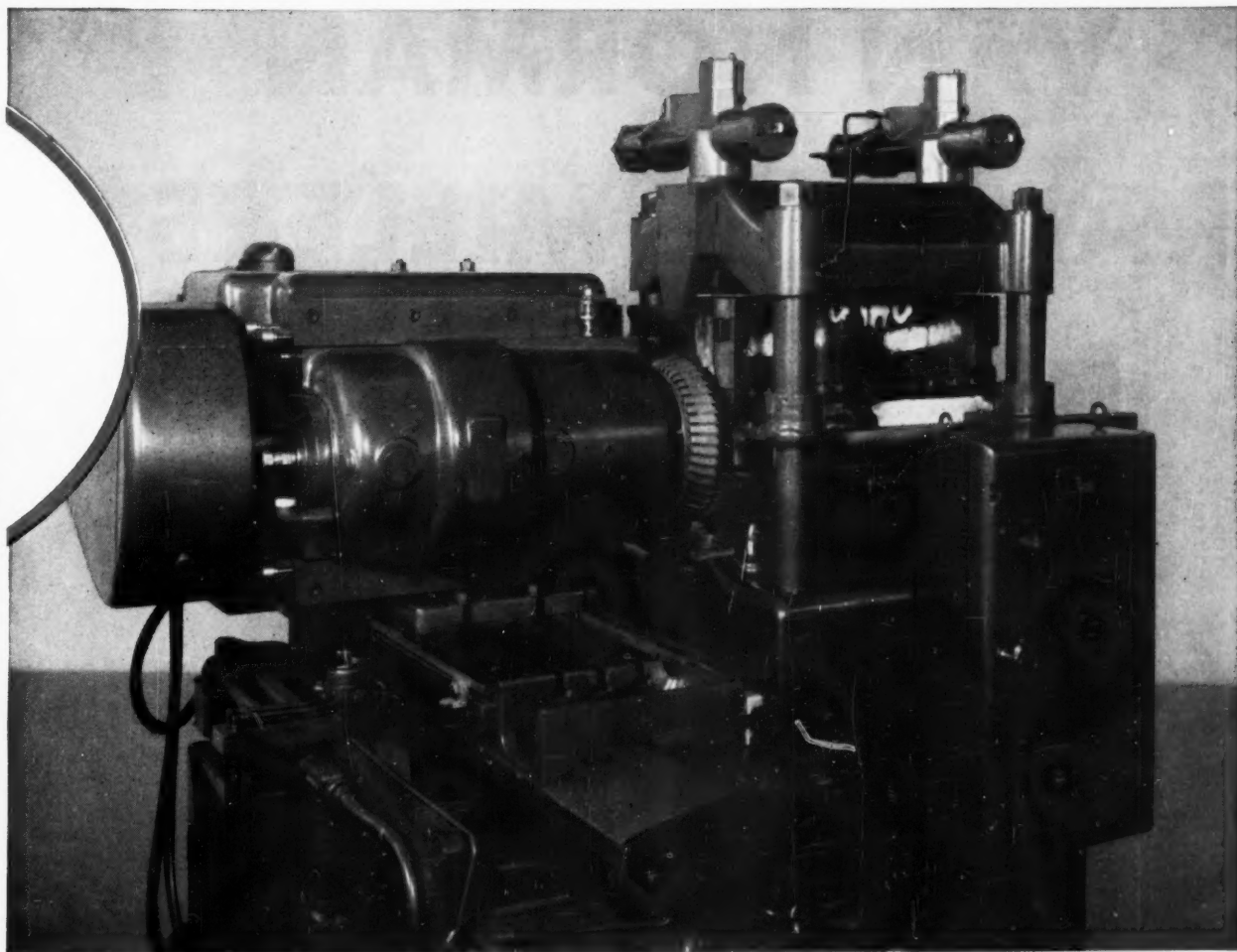
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## THE CINCINNATI HYDRAMATIC LINE:

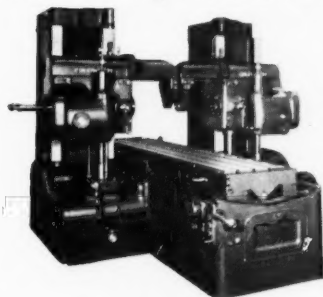
Plain and Duplex styles, conventional and tracer controlled types, 18 sizes of each, 24" to 90" table traverse, 10 hp to 50 hp drive, standard and complementary unit construction for flexibility in building single-purpose machines.

- 1—Plain Hydromatic. Catalog No. M-1670-2
- 2—Duplex Hydromatic. Catalog No. M-1670-2
- 3—Plain Tracer Controlled Hydromatic. Catalog No. M-1602-1
- 4—Duplex Tracer Controlled Hydromatic. Catalog No. M-1602-1

# CINCIN



Unorthodox procedures sometimes work out to advantage. In this example, the work and cutter spindle head have been interchanged for an accurate milling operation on cylinder blocks. A lower unit cost resulted, and here are the reasons why. ¶ The machine, basically a CINCINNATI No. 3-24 Hydromatic Miller, is equipped with a spindle carrier mounted on the table, and a "dummy" headstock which incorporates a con-



4

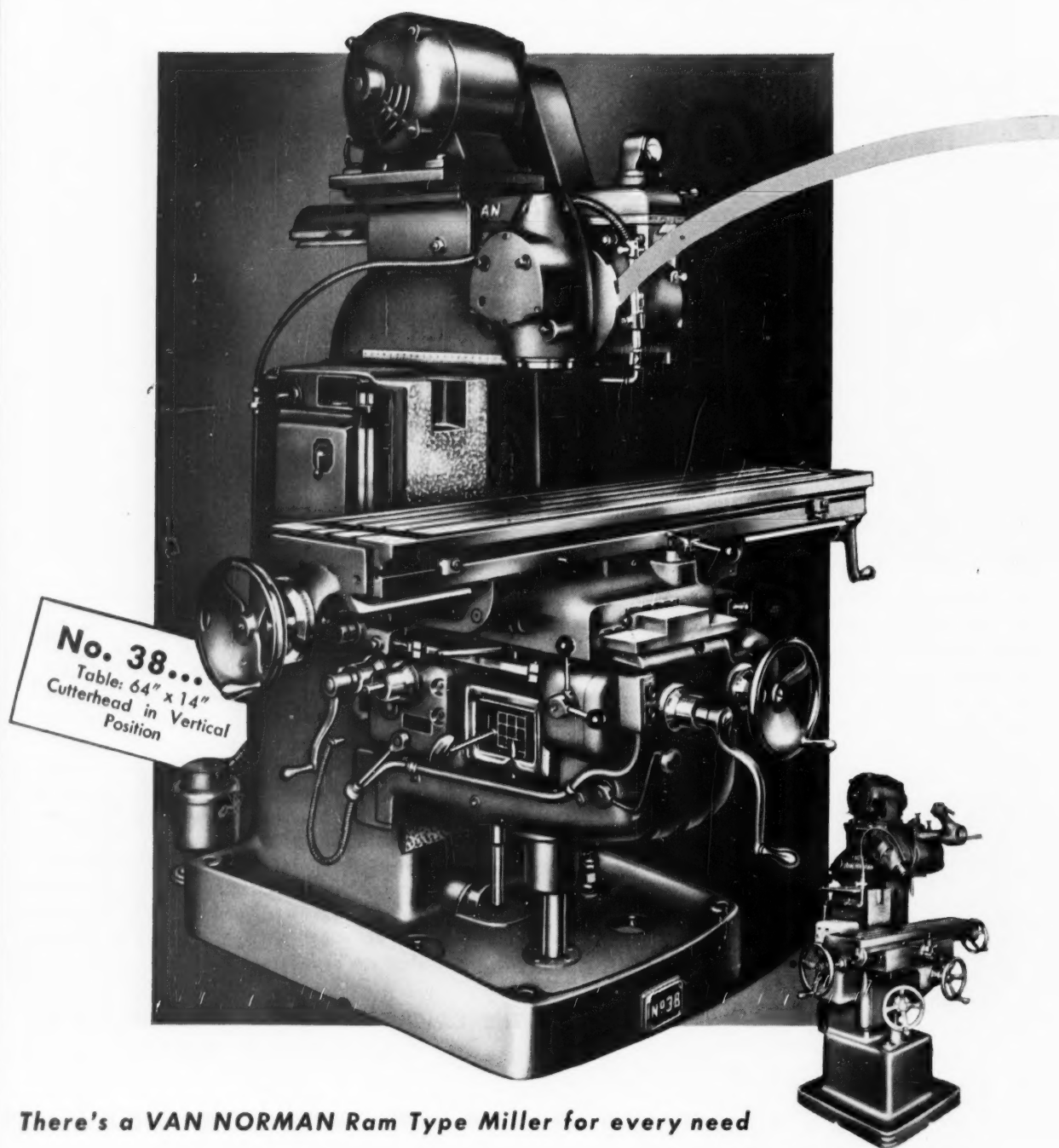
veyor height fixture. The spindle carrier may look familiar to you . . . with minor alterations, it's the standard vertical head of a CINCINNATI No. 3 Vertical High Power Dial Type. To reduce physical effort for the operator, the fixture is pneumatically operated. A 12" diameter sintered carbide cutter takes the cut at 25" per minute. ¶ As you might suspect, this adaptation is the work of Cincinnati Application Engineers. These men are expert at taking standard units of CINCINNATI Milling Machines and putting them together with a minimum of special work to build up single purpose equipment to meet your requirements. Whether it's a tailor-made machine or merely a special unit, you can be sure of justifying your replacement policy with CINCINNATI handling your milling problems. May we hear from you?

**THE CINCINNATI MILLING MACHINE CO.**  
**CINCINNATI 9, OHIO**

# NATI

**MILLING MACHINES • CUTTER SHARPENING MACHINES • BROACHING  
MACHINES • METAL FORMING MACHINES • FLAME HARDENING MACHINES  
OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID**

# VAN NORMAN RAM TYPE MILLERS



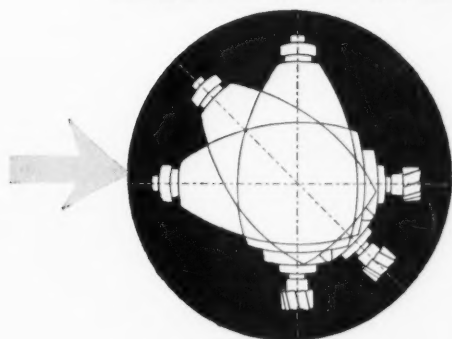
**No. 38...**  
Table: 64" x 14"  
Cutterhead in Vertical  
Position

**No. 12 Table: 37½" x 9⅞"**  
Cutterhead in Angular Position

***There's a VAN NORMAN Ram Type Miller for every need***



# *Eliminate Idle Machine Time up to 50%*



**The adjustable cutterhead  
meets all milling requirements...  
Horizontal, Angular, Vertical...  
with ONE Miller**

The versatility of the Van Norman ram-type milling machines provides a greater work range than available on single purpose machines.

The adjustable cutterhead in combination with the movable ram enables you to perform conventional horizontal and vertical as well as angular milling. This feature reduces work setups and reduces idle machine and operator time by as much as 50% . . . increases productivity proportionately. In addition, front and rear directional con-

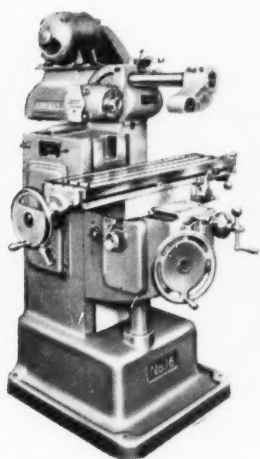
trols of power feeds simplify operations . . . cut operator fatigue.

The Van Norman ram-type millers are ideal for use in the tool room, job shop, pattern shop, experimental laboratory, die and mold shop and for production work.

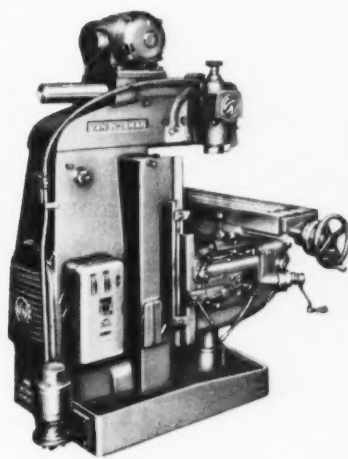
Because Van Norman Ram Type Millers enable you to meet all milling jobs, they keep operators and machines working. They cut costs, improve accuracy and increase production.

## **VAN NORMAN COMPANY**

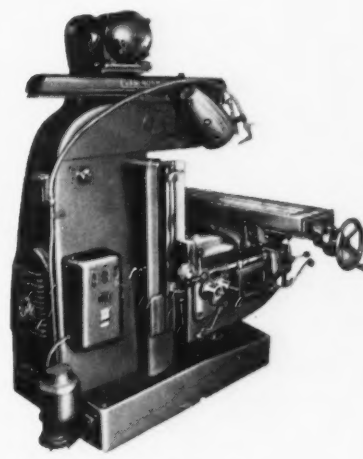
SPRINGFIELD 7, MASSACHUSETTS, U. S. A.



**No. 16 Table: 37" x 9½"**  
Cutterhead in Horizontal Position



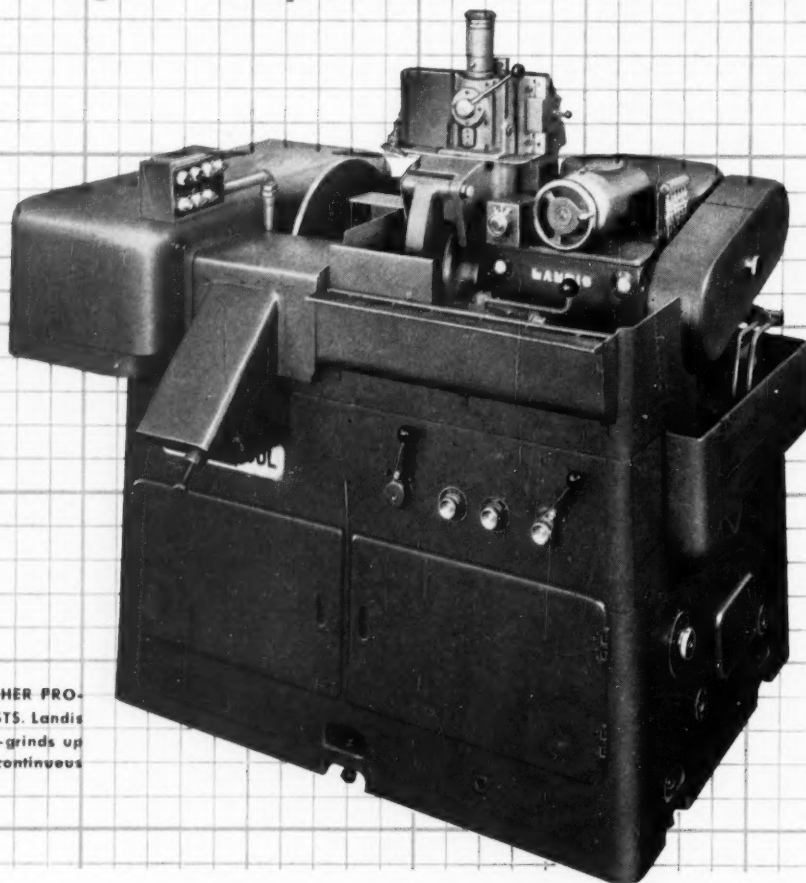
**No. 22L Table: 45" x 10"**  
Cutterhead in Vertical Position



**No. 26 Table: 58" x 13"**  
Cutterhead in Angular Position

# **JOB ENGINEERED** For Lower

*LANDIS Single Purpose Production Grinders*



JOB-ENGINEERED FOR HIGHER PRODUCTION AND LOWER COSTS. Landis Jet Blade Contour Grinder—grinds up to 5 surfaces in one continuous operation.

Landis Single Purpose Grinders are Job Engineered to meet special production problems. The need may be for reduced handling time, greater precision, automatic operation or an automatic cycle for unskilled operators. The machines illustrated here are examples of Landis Job Engi-

neered Grinders that are solving problems such as these.

If you are thinking about reduced grinding costs, it will pay you to check with Landis. We will be pleased to give you tooling suggestions and production estimates based on your work prints.

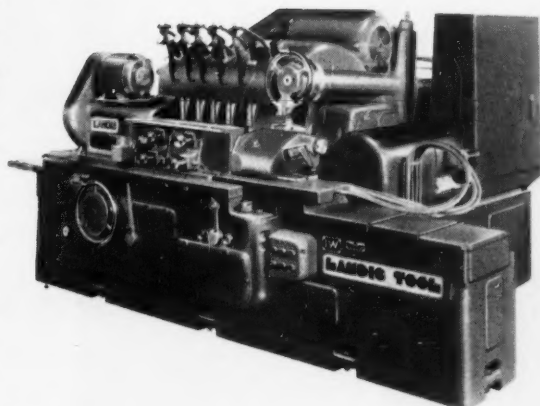
165

# **LANDIS**

**precision grinders**

# Unit Grinding Cost!

**JOB ENGINEERED FOR LESS WORK HANDLING**



**Multiple Wheel Grinder**

Grinds up to 10 diameters in one operation. For infeed grinding of concentric diameters in one operation—straight, tapered, profiled.

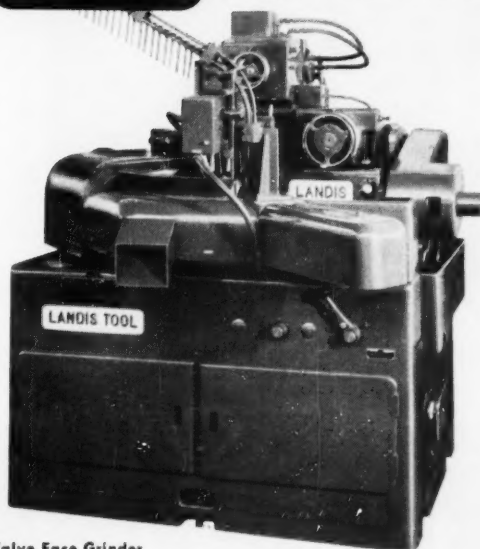
**JOB ENGINEERED FOR SUPER-PRECISION**



**Concentric Grinder**

Automatically grinds external surface concentric to bore. For high production of straight, profiled, tapered surfaces to precision tolerances.

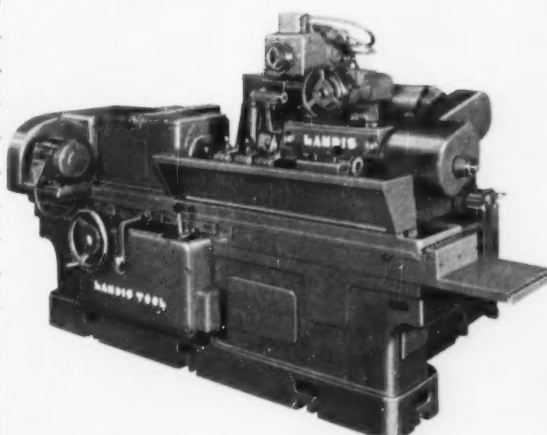
**JOB ENGINEERED FOR AUTOMATIC OPERATION**



**Valve Face Grinder**

Automatic operation triples man-hour output. Automatic loading, automatic grinding cycle and automatic unloading give low cost production.

**JOB ENGINEERED FOR CAM CONTOUR GRINDING**



**Cam Grinder**

Automatic cycle permits one operator to handle several machines. Automatic grinding cycle and automatic dressing cycle require attention only for loading and unloading.

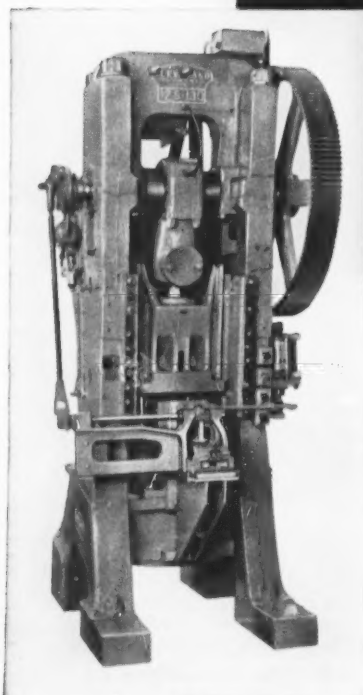
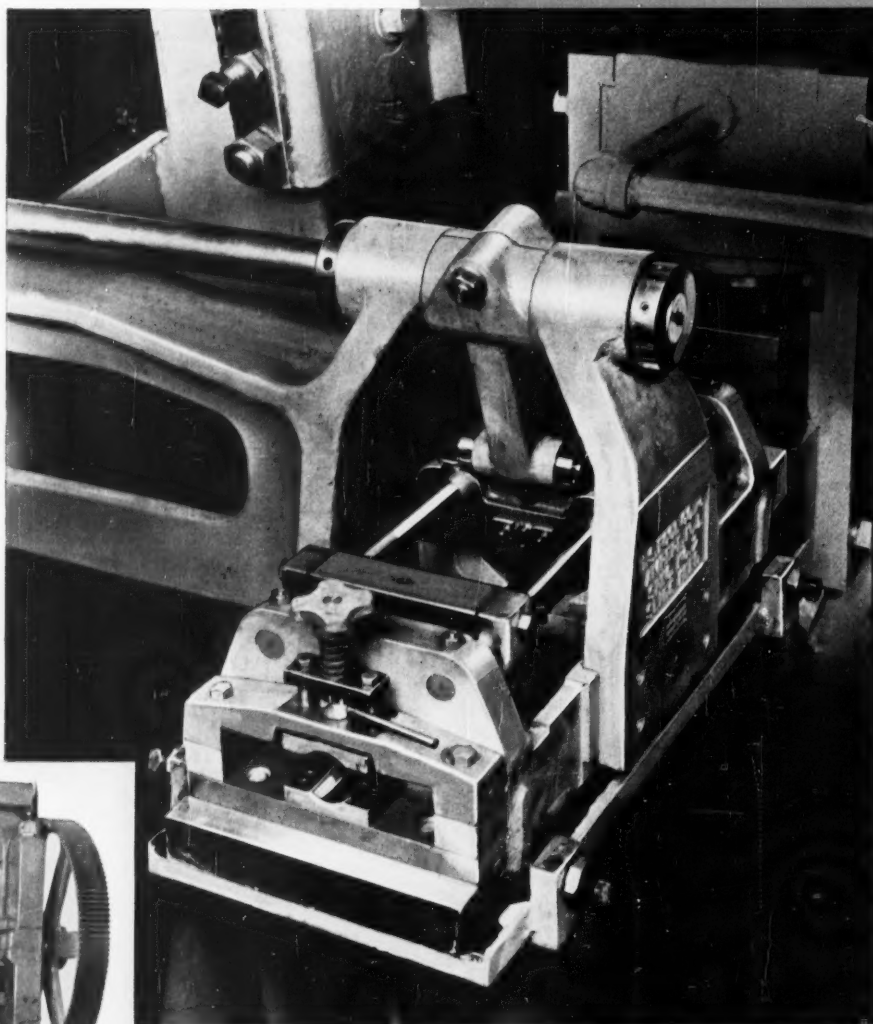
**LANDIS TOOL COMPANY / WAYNESBORO, PA., U.S.A.**



The close-up directly below shows U. S. Slide Feed arranged to accommodate 1 3/8" diameter bar stock mounted on press manufactured by the Cleveland Punch and Shear Works Co.

The lower illustration shows the complete press with U. S. Slide Feed and driving connections as it will be installed in the plant of The Metal Specialty Company in Cincinnati, Ohio.

# U.S.



## U.S. TOOL

# Slide Feeds

## Solve Your Press Room Problems

### For Example . . .

The Cleveland Punch and Shear Works Co., Cleveland, Ohio, received an order from The Metal Specialty Company, Cincinnati, Ohio, to furnish a number of their presses equipped with automatic feeds to feed 1 3/8" diameter bar stock into the press for a cut-off operation. Because of the nature of the job and the accuracy required, it was decided to use U. S. Slide Feeds.

### Accuracy . . .

With the set-up above described, the accuracy of feed length must be such that the weight of the cut-off pieces be within closely controlled limits. The U. S. Slide Feed advances the 1 3/8" diameter bar stock into the die 3/4" at each stroke of the press, and the weight of the cut-off pieces varies less than 1 gram. With the U. S. Slide Feed the travel of the feed block is constrained between positive stops, thus assuring controlled accuracy.

### Versatility . . .

U. S. Slide Feeds are known for their accuracy in the feeding of flat stock from coils, but as described above, they can be used with equally satisfactory results for feeding round wire, bars, and stock of irregular cross section. Also, in addition to metals, U. S. Slide Feeds can be used for the feeding of materials such as paper, plastic, mica, etc.

If you have a press feed problem, ask for a copy of Bulletin 80M on U. S. Automatic Press Room Equipment, which contains illustrations and descriptions of U. S. Slide Feeds, Straighteners, Stock Reels, Coil Cradles, Stock Oilers, Scrap Choppers, etc.

# COMPANY, Inc.

AMPERE (East Orange)  
NEW JERSEY

Builders of U. S. Multi-Slides—U. S. Multi-Millers

U. S. Automatic Press Room Equipment—U. S. Die Sets and Accessories

# This part is the blueprint, with a



Model D Cycle Time (floor to floor) — 17 minutes

Previous cycle Time (floor to floor) — 24 minutes

## PRODUCTION DATA

|               |                              |                    |           |
|---------------|------------------------------|--------------------|-----------|
| Part.....     | Control Valve Lever          | Spindle Speed..... | 530 rpm   |
| Material..... | SAE 1020                     | Lot Size.....      | 50 pieces |
| Cutter.....   | 1/2 in. — 2-lip HSS End Mill | Machine.....       | Model D   |

# finish-milled direct from single setup, in 17 min.!

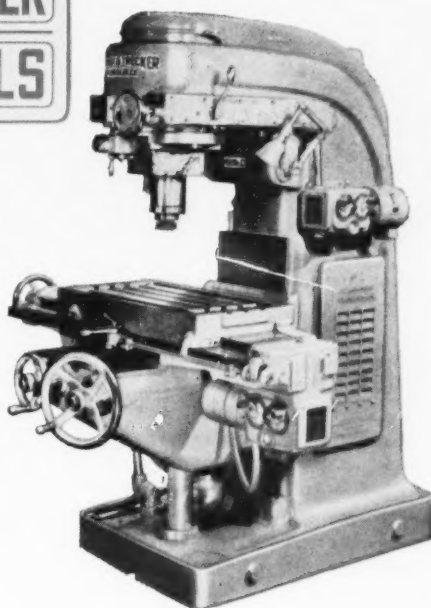
## Kearney & Trecker Model 2D Rotary Head Milling Machine saves six hours on 50 piece run

**H**ERE is another example of the tremendous time and tooling savings possible with the rotary head milling method.

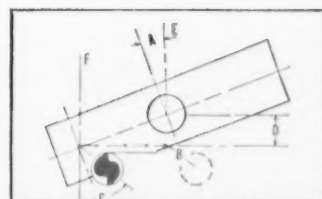
This manufacturer used to complete a control lever every 24 minutes. Now the same work is completed in only 17 minutes. . . . and no multiple setups or expensive form cutters are necessary. The blueprint is the only guide the operator needs — the machine's precise mechanical control of the cutter's angular and radial movements does the rest.



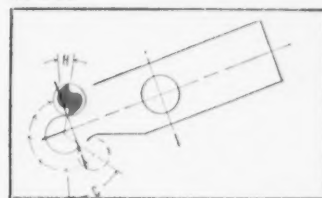
Here's the Rotary Head Milling Machine Production Idea Booklet. It contains several examples of how this method has been found exceptionally efficient in solving production, die, forging and metal pattern milling problems. It's yours for the asking. Address requests to Kearney & Trecker Corp., 6784 W. National Ave., Milwaukee 14, Wisconsin.



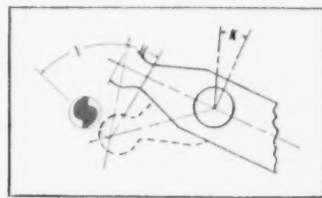
**THIS IS THE MACHINE** that will handle your light production milling faster, easier and at tremendous savings over any other method. If you have any production problems in plastic molds, die-casting, forging and stamping dies, or selected production milling operations — it will pay you to investigate the Model 2D Rotary Head Milling Machine.



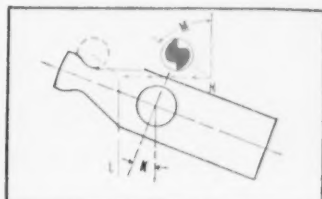
**1. MILL 20° ANGLE.** Index piece to angle (A), offset spindle slide to radius (B), set rotary head to angle (C), saddle to (D), feed table (E) to (F).



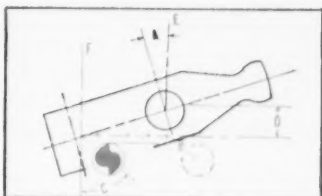
**2. MILL .642/.645 DIAMETER.** Rotate head angle (C) to angle (H).



**3. MILL 1 1/2 IN. RADIUS.** Rotate head from angle (H) to angle (J), index dividing head from angle (A) (Oper. 1) to angle (K).



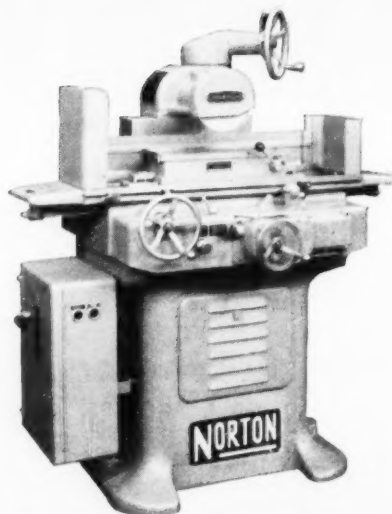
**4. MILL 20° ANGLE.** With piece at (K), move center of head to (L), rotate head to (M). Feed table (L) to (N).



**5. MILL SAME FORM ON OPPOSITE END.** Repeat operations 1 through 4 by indexing the workpiece to angle (A-Oper. 1).



*In your smaller surface grinding jobs . . .*  
**Get the speed-plus-accuracy**  
**that means the**  
**“TOUCH of GOLD”**  
**with this Norton 6" x 18"**



**Fast! . . . Accurate!** The Norton 6" x 18" hydraulic surface grinder helps you produce more at lower cost — your profit-building "Touch of Gold."

Rapid, precise operation is one of the built-in advantages of the Norton 6" x 18" hydraulic surface grinder. That's why you can always count on it for accurate plane surfaces in less grinding time — the product-improving, cost-cutting "Touch of Gold" that means more and better grinding for less money.

It will pay you to learn more about its

many advanced features that step up performance to *extra* efficiency and economy. Ask your Norton Representative for the whole story. Meanwhile, write us direct for Catalog No. 954. *And keep this in mind — only Norton offers you such long experience in both grinding wheels and machines.*

NORTON COMPANY, Worcester 6, Mass.

**To Economize, Modernize With NEW**

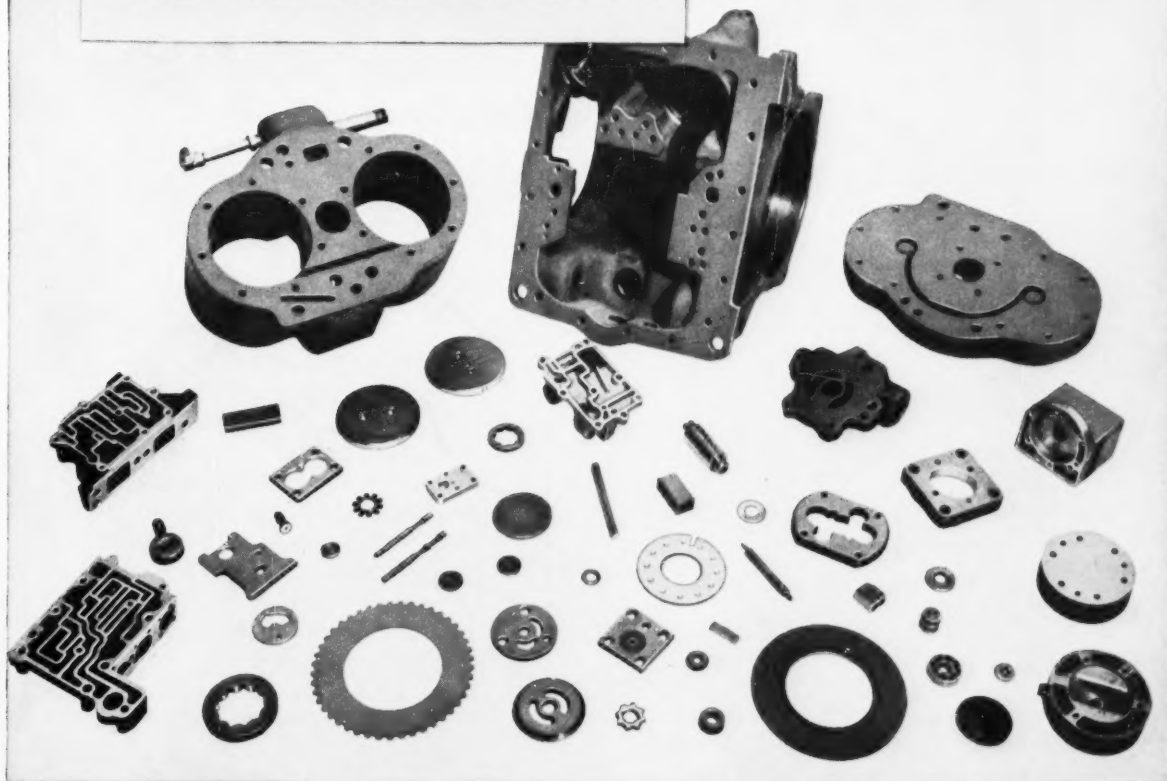
**NORTON**

**GRINDERS and LAPPERS**

*Making better products . . .  
 to make other products better*

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**Norton announces...**



Your product parts will perform better — and gain in value — when the product-improving "Touch of Gold" is added in Norton's new Job Lapping Department

## A new, enlarged job lapping service

Now you can improve your product quality with precision lapped parts!

The new Norton Job Lapping Service is ready to help you improve product quality and performance — by furnishing parts to your exact specifications.

Complete and modern in every detail, the new department is manned by expert personnel, operating Norton machines for every type of lapping. Results are checked on the latest electrical and optical inspection equipment, while precision accuracy is further assured by careful atmosphere control. The scope of jobs that can be handled is broad, covering:

**Materials** — Practically unlimited in range, including hardened steel, stain-

less steels, stellite facings, cast iron, non-ferrous pressed and die-cast parts.

**Types of Lapping** — Single and parallel face flat lapping, to specifications ranging from stock removal to optical flatness. Also, external cylindrical lapping to high precision requirements.

**Workpiece Capacities** — Flat work up to 24" across. Cylindrical work from 1/16" diameter by 1/2" long to 2" diameter by 8" long.

**Meeting Your Needs Exactly** — The entire project is under direct supervision of Norton Lapping Engineers, pioneers in the development of mechanical lapping processes and machines.

They are prepared to work out the best lapping techniques for your requirements. For full details, see your Norton Representative or write us direct. NORTON COMPANY, Machine Division, Worcester 6, Mass.

To Economize, Modernize With NEW



**GRINDERS and LAPPERS**

*Making better products...  
to make other products better*

District Sales Offices: Hartford • New York • Cleveland • Chicago • Detroit • In Canada: J. H. Ryder Machinery Co., Ltd., Toronto 5

For more information on products advertised, use Inquiry Card, page 239

MACHINERY, September, 1953—17

Lowering the Cost  
of Tapped Holes:

# THE PRINCIPLE OF BALANCED

*Action*

It saves money by giving you consistently accurate work, *minimizing scrap losses*. It saves money by giving you *longer tool life*.

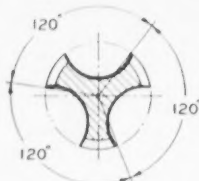
**WINTER BROTHERS COMPANY**  
Rochester, Mich., U.S.A.

Distributors in principal cities. Branches in New York, Detroit, Chicago, Dallas, San Francisco. Division of National Twist Drill & Tool Co.

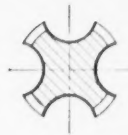
ALWAYS AT  
YOUR SERVICE



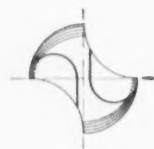
Your local Industrial Supply Distributor carries a complete stock of WINTER Taps.



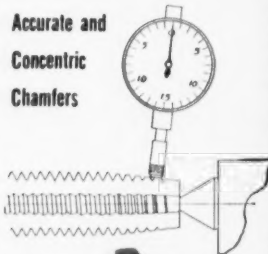
Exact Flute Spacing



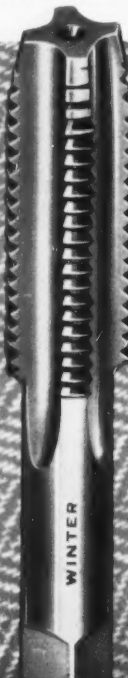
Uniform Flute Contours



Precision Chip Driver Contours



Accurate and  
Concentric  
Chamfers







# National



## Today . . . Expect To Cut Metals at Lower Cost YOU CAN—WHEN YOU HAVE CUTTING-EDGES LIKE THESE

It's the cutting-edge that counts. Cutting tools today, as National designs and manufactures them, will produce more pieces at lower cost. National gives you the edge!

**NATIONAL TWIST DRILL AND TOOL COMPANY**  
Rochester, Mich., U.S.A.

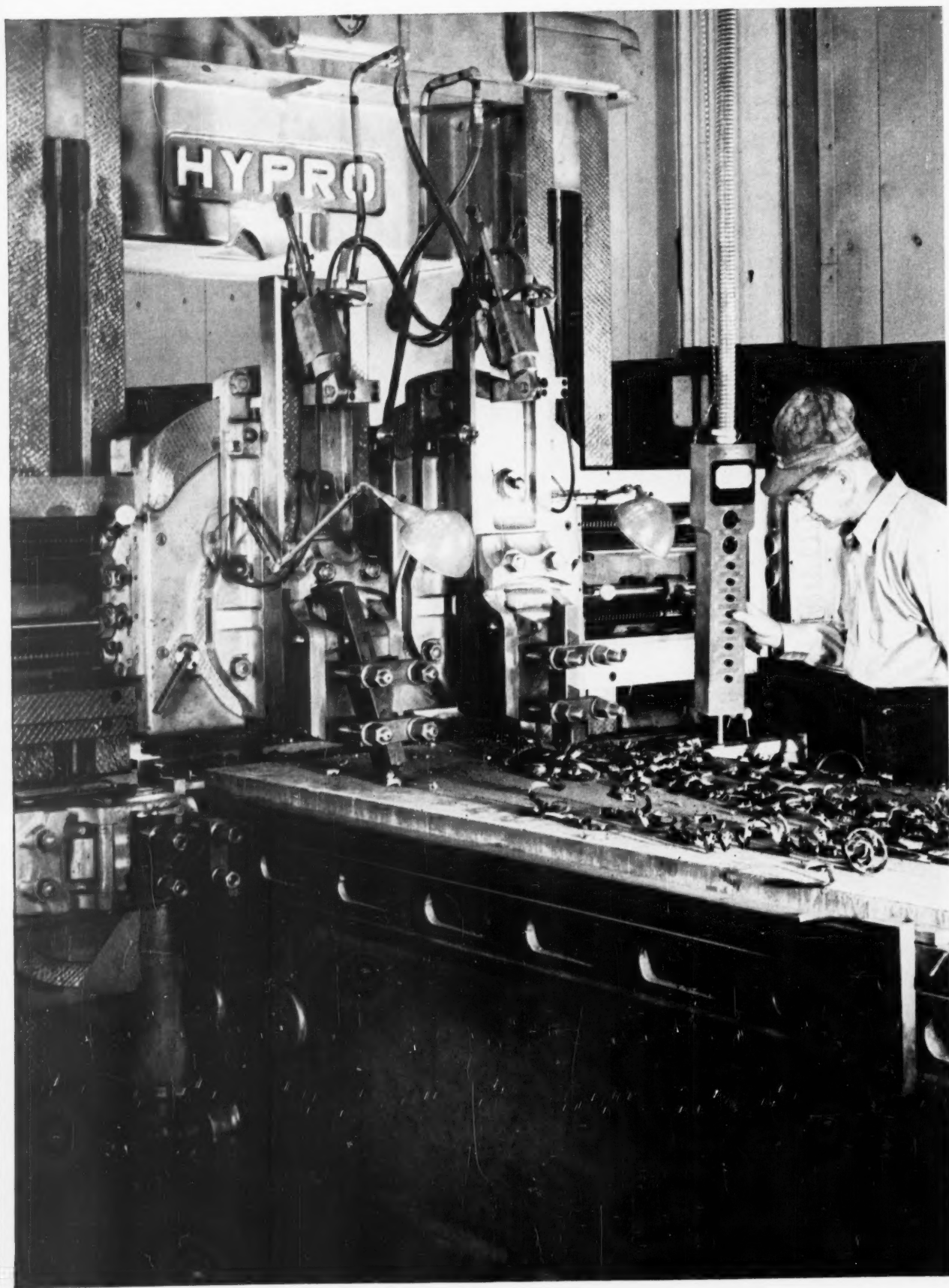
Distributors in principal cities. Factory Branches: New York, Detroit, Chicago, Dallas, San Francisco



**CALL YOUR  
INDUSTRIAL SUPPLY  
DISTRIBUTOR**

. . . for all your staple industrial needs, including NATIONAL Twist Drills, Reamers, Counterbores, Milling Cutters, End Mills, Hobs, and Special Tools.





# Carbide finger... with the Midas touch!

**This G & L Double Housing Planer will help you make a handsome profit on every job, big or small. It has the proper power application and extra rigidity necessary to perform carbide planing operations at 300 ft. per minute**

If you're searching for a heavy planer that allows you to get the fastest, most economical use of carbide cutting tools, investigate the G&L line of Double Housing and Open Side Planers.

These massive machines offer you many important advantages. In addition to the inherent rigidity of the rail, heads, housings, table and bed — a twin helical gear train table drive provides straight power flow to eliminate side thrust.

G&L HYPRO Double Housing Planers and Open Side Planers are available with working widths up to 144 inches... variable voltage drives up to 100 hp... bed lengths to suit the particular model. For complete details, see your G&L representative, or write —



**GIDDINGS & LEWIS  
MACHINE TOOL CO.**

FOND DU LAC, WISCONSIN

*Builders of the world's finest heavy-duty machine tools—Horizontal Boring, Drilling and Milling Machines—table, floor and planer types; Hypro Double Housing and Open Side Planers; Planer Type Milling Machines and Vertical Boring Mills; and Davis Cutting Tools*



## ***Are You making full use of your "friend in time of need?"***

He's no "fair-weather friend"—your Morse-Franchised Distributor. He's your *first aid* in time of trouble, when time's a-wasting. Whatever you need in Morse Cutting Tools, he's got it or can get it on the jump. And he knows his book on engineering these tools to your job. Yes, he's right on the spot to save you production time . . . not to mention purchasing and bookkeeping time, too.

So always call your Morse-Franchised Distributor for the best service on the best cutting tools made. Remember . . . *when he walks in the door, trouble flies out the window.*

**MORSE TWIST DRILL & MACHINE COMPANY**  
**NEW BEDFORD, MASSACHUSETTS**

(Division of VAN NORMAN CO.)

Warehouses in New York, Chicago, Detroit, Houston, San Francisco



# MORSE

## Cutting Tools

*Buy them by phone  
from your Morse-Franchised  
Distributor and save  
ordering time*

For more information on products advertised, use Inquiry Card, page 239

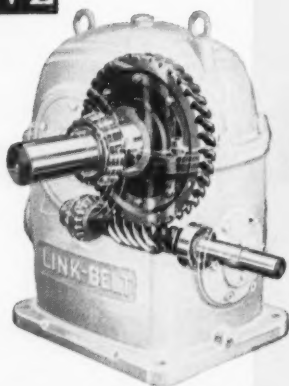
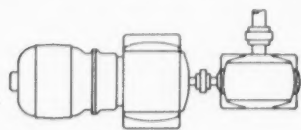
MACHINERY, September, 1953—23



# How to change even complex speed reduction problems into simple ones

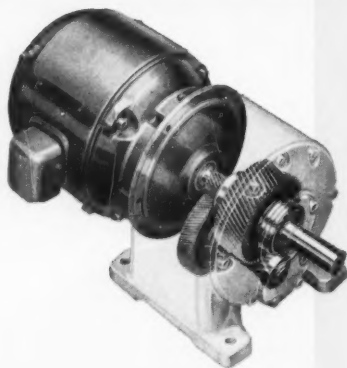
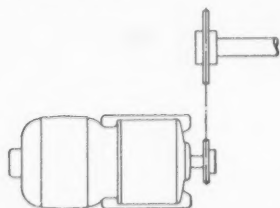
## WORM GEAR DRIVE

WORM GEAR and P.I.V. variable speed drives are shown direct-coupled. Link-Belt worm gear drives are available in 3.1:1 to 8000:1 reduction ratios—1400 to 123,000 in. lbs. torque—0.22 to 564 output shaft rpm. Ask for Book 2324A.



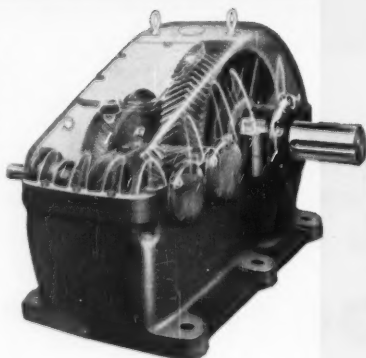
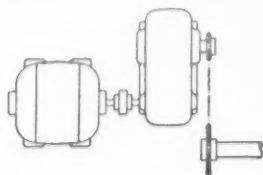
## GEARMOTOR & HELICAL GEAR DRIVE

GEARMOTOR is shown with roller chain drive. Link-Belt Helical Gear Drives, Gearmotors and Motogears are available in 6.2:1 to 292:1 reduction ratios—1 to 30 hp—6 to 280 output shaft rpm. Ask for Books 2247 and 2451.



## HERRINGBONE GEAR DRIVE

HERRINGBONE GEAR DRIVE is shown connected by flexible coupling to motor and with roller chain take-off. Link-Belt Herringbone Gear Drives are available in 2.84:1 to 326:1 ratios—0.4 to 2480 hp—2.2 to 623 output shaft rpm. Ask for Book 2519.



Get the proper drive combination that best meets your requirements from the broad LINK-BELT line

In addition to matching a wide range of requirements for ratio, hp, loading conditions and similar factors—Link-Belt enclosed gear drives offer you other benefits. When your Link-Belt representative selects a helical, herringbone or worm gear drive, you have no worries about coordinating it with your other components.

For Link-Belt builds a complete power transmission line. There's no need to exchange drawings with a third person to calculate chain, sprocket, coupling, bearing or even shafting requirements. You can get all these from one source . . . each pre-engineered for perfect fit.

Next time you're faced with a speed reduction problem, take it to power transmission headquarters. There's a Link-Belt sales office or distributor near you. Call today for complete engineering information.

**LINK-BELT**  
ENCLOSED GEAR DRIVES

LINK-BELT COMPANY: Plants: Chicago, Indianapolis, Philadelphia, Colmar, Pa., Atlanta, Houston, Minneapolis, San Francisco, Los Angeles, Seattle, Toronto, Springs (South Africa), Sydney (Australia). Sales Offices, Factory Branch Stores and Distributors in Principal Cities.

13, 126

# GARDNER

*abrasive discs*

**4 ways**  
to improve operation  
of any disc grinder

## FULL VALUE

Long cutting life with all of wheel thickness of usable abrasive.

## FAST, COOL CUTTING

Corrugated for large area contact on thin parts. Three sizes of corrugations available.

## EXTRA SAFETY

WIRE-LOK construction guarantees complete safety.

## FINE FINISHES

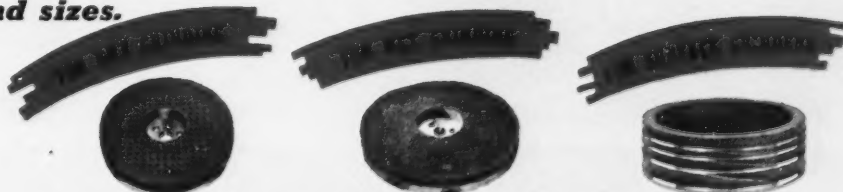
Uniform fine grain character of finish is of prime importance and stock removal is light.



WRITE FOR BOOKLET

## GARDNER WIRE-LOK ABRASIVE DISCS

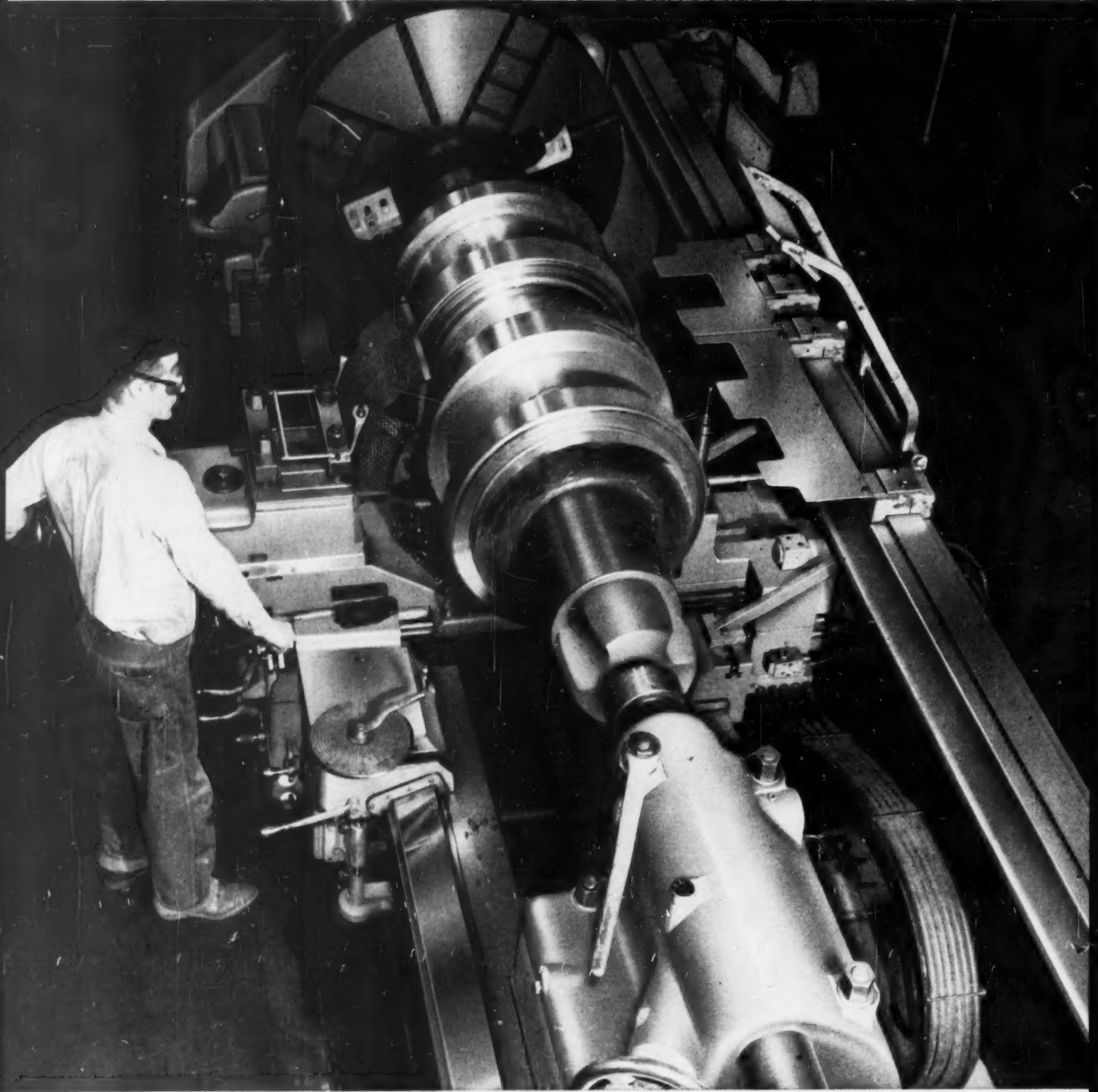
full range of types and sizes.



**GARDNER MACHINE COMPANY**  
414 East Gardner Street • Beloit, Wisconsin, U.S.A.

100A

# LeBlond Lathe eases cost squeeze ...on rolls that



A set of Shape rolls of 30 1/2" dia. x 51" body cast alloy semi-steel are turned to .005" tolerance in 94 hours on this 50" LeBlond Roll Contouring Lathe. Set-up time—1/4 hour. Clamped-on and brazed-on carbide tips are used at 48 rpm, .040 ipr feed. Conventional roll lathe took 245 hours for the same set of rolls.



# squeeze channels from blooms

*U. S. Steel  
Lops 151 Hours Off  
245-Hour Roll-Turning Job.*

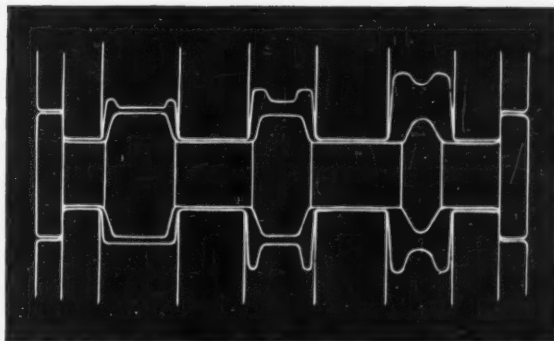
Every day at U. S. Steel's Clairton Works, Clairton, Pa., miles of "hotter-than-orange" steel are squeezed through the passes of rolls like these for reduction, elongation, shaping. They come out as finished structural steel for the "jungle-gym" frameworks of modern buildings. Turning these costly shape rolls with their steep-angle contours used to keep a lathe running 245 hours on a set of roughing rolls at U. S. Steel. Tool life was short and the job required highly skilled operators. Stepped-up schedules called for a new solution to this tough-nut production problem.

A LeBlond 50" Roll Contouring Lathe, as recommended by Pittsburgh Distributor, Barney Machinery Co., immediately slashed the 245-hour turning time by an astonishing 61.7%. Now U. S. Steel saves 151 hours on one set of roughing rolls—more than enough time to turn out two more just like it. Tool life is greatly improved and less experienced operators can handle the work.

The 50" LeBlond Roll Contouring Lathe is equipped with two-directional hydraulic tracing. A single valve automatically controls two hydraulic motors for cross and length feed. A stylus follows a flat template mounted at the back of the lathe. Feed and speed can be varied during a cut without leaving a tool mark. For roughing,

*Ask for complete information  
on Roll Contouring Lathes in  
25", 32", 40" and 50" sizes.*

**Turned faster by**



*Typical roughing rolls for 8" channel*

hydraulic cross feed can be by-passed and length feed used separately. This enables operator to cross feed manually, use template as length stop. Mechanical power rapid traverse to carriage and cross slide is also provided. All controls are located conveniently at the apron. The lathe uses a 40 constant horsepower DC motor, has nine speed changes in the headstock, delivers infinitely variable speeds from 1 to 165 rpm.

Whether your turning jobs involve specialized production like roll-turning, or call for high precision, high production—investigate LeBlond's complete line of 76 lathe models. LeBlond engineers will help you get a better turning job, faster. Write today or see your nearby LeBlond Distributor.



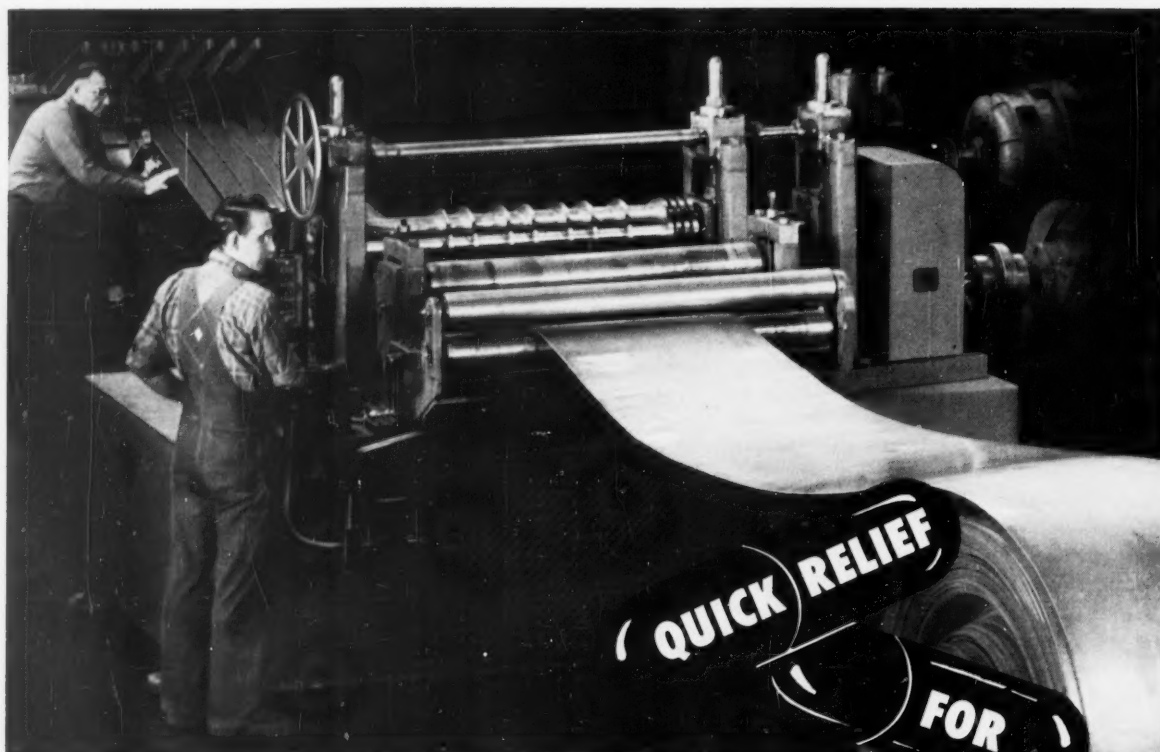
**THE R. K. LEBLOND MACHINE TOOL COMPANY, CINCINNATI 8, OHIO**

**WORLD'S LARGEST BUILDER OF A COMPLETE LINE OF LATHES • FOR MORE THAN 66 YEARS**

For more information on products advertised, use Inquiry Card, page 239

**MACHINERY, September, 1953—27**





## Slitting Service

**HEADACHES**

● If your monthly requirements of coiled strip exceed 100 tons, in many different widths and gauges, installing a Yoder slitter may not only result in worthwhile economies but in eliminating costly production bottlenecks.

Coiled strip in standard widths is obviously lower in first cost than slit-to-width strip; the sources of supply are more numerous and deliveries much quicker.

The savings effected by doing your own slit-

ting of moderate tonnages, soon pays for your investment in a Yoder slitter. Equally important, your inventory requirements and production planning are greatly simplified, as you can, from a relatively small stock of standard widths, in a few hours supply your own needs in slit strands.

The economies as well as the mechanics of slitter operation are fully discussed and illustrated in the Yoder Slitter Book, free on request.

**THE YODER COMPANY • 5504 Walworth Avenue, Cleveland, Ohio**

### Complete Production Lines

- ★ **COLD-ROLL-FORMING** and auxiliary machinery
- ★ **GANG SLITTING LINES** for Coils and Sheets
- ★ **PIPE and TUBE MILLS**—cold forming and welding





## CIMCOOL LOWERS COSTS *and does a better job!*

It's no secret that CIMCOOL® opens the way to real savings. Plant after plant reports that this radically new and different cutting fluid—this *chemical emulsion*—does a *better job*, while saving money three important ways:

- CIMCOOL INCREASES TOOL LIFE (and thus reduces down time) because of its chemical lubricity.
- FASTER SPEEDS are possible because Cimcool cools faster, through a unique physical change in the cutting fluid itself. Tools and chips actually stay cool to the touch.
- CIMCOOL COSTS LESS than old-fashioned cutting fluids because it lasts longer. It also cuts labor costs for cleaning and changing. It virtually eliminates rancidity and foul odors. And because of its low surface tension and low adhesion to work and chips, there is practically no carry off.

It's a safe bet that one week's run will convince you that Cimcool is far superior to old-fashioned coolants. For a demonstration in one of your own machines, write us and we'll have one of our Cincinnati Milling-trained machinists call on you—without cost or obligation. Or, if you prefer, write for our free booklet, "Cimcool Defeats Heat." Address, Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

®TradeMark Reg. U.S. Pat. Off.

# CIMCOOL

*for 85%  
of all metal cutting jobs*

A PRODUCTION-PROVED PRODUCT OF THE CINCINNATI MILLING MACHINE CO.



# HOW WARNER & SWASEY FOR THOR POWER TOOL

Take a look at some of the typical time and cost savings delivered by Warner & Swasey 5-Spindle Automatic Bar Machines at Thor Power Tool Co., Aurora, Illinois...



## REDUCTION GEAR BLANKS

**Savings pay for several new machines!**

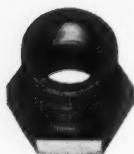
Large variety required—in lot sizes of 150-1500 pieces. Material: 8460 Steel.

### **Previous method:**

2 single-spindle automatics, running continuously.

### **NOW**

—One Warner & Swasey 5-Spindle Automatic does complete machining in equivalent of 4 days a week.



## REDUCER BUSHING

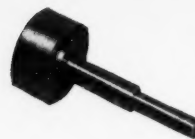
**Cuts Class 4 threads in same operation—costs reduced 8.5 to 11!**

### **Previous method:**

Threads milled, following rough forming on single-spindle automatic.

### **NOW**

—Complete machining finished on Warner & Swasey 5-Spindle Automatic in one operation in 27 seconds!



## DRIVE SHAFT IMPACT SPINDLES

**Accuracy and rigidity deliver 4 to 1 savings!**

Material: Super tough rivet set alloy, especially made for Thor.

### **Previous method:**

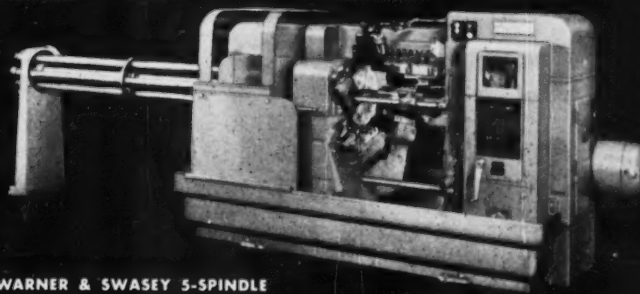
Roughed on single-spindle automatic, straddled to length on turret lathe—both machines running at half speed.

### **NOW**

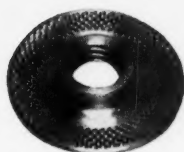
—finished for grinding in single operation on Warner & Swasey 5-Spindle Automatic running at full speed.

YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS WITH WARNER & SWASEY

# AUTOMATICS CUT COSTS COMPANY



WARNER & SWASEY 5-SPINDLE  
AUTOMATIC BAR MACHINE



## SANDING PAD NUT

**One machine does work spread over 3 departments!**

**Problem:** To thread part at perfect 90° angle to outside face, and hold concentricity.

### **Previous method:**

Part machined in 3 different departments. Difficulty was experienced in holding piece in fixture for knurling.

### **NOW**

—Thread tapped into bar stock and balance of cuts made, including knurling, in one operation on Warner & Swasey 5-Spindle Automatic.



## THIN WALLED PROTECTION NUT

**Combines operations at high removal rate!**

### **Previous method:**

Three operations — rough turned, relief cut made in second operation; Class 3 threads hobbled in third. Cost of last step alone ran 20¢ per part.

### **NOW**

—finished in one operation in 132 seconds on Warner & Swasey 5-Spindle Automatic.



## LOCK COLLAR

**Slashes machining time on longer runs!**

**Quantities:** 20,000—30,000 pieces.

### **Previous method:**

Run on conventional multi-spindle automatics in 75 seconds.

### **NOW**

—on Warner & Swasey 5-Spindle Automatics parts made in 27 seconds!

**WARNER  
&  
SWASEY**

*Cleveland*

PRECISION  
MACHINERY  
SINCE 1880

MACHINE TOOLS, TEXTILE MACHINERY, CONSTRUCTION MACHINERY



# Need low starting friction and long bearing life?

*here's how leading manufacturers of business machines  
get them with **NEEDLE BEARINGS***



Torrington Needle Bearings are essential design features of many business machines because of their low starting and running friction, their long trouble-free service.

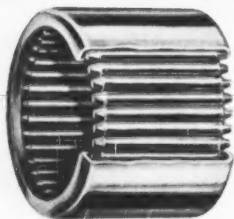
They have been *performance-proved* by years of day-in and day-out service on such machines as electric typewriters, addressing and duplicating machines, accounting machines, rotary card file systems, etc.

On the conveyor rolls, sprockets, gears, tape and feed roll shafts of duplicators, for example, Needle Bearings help reduce power requirements and keep motor size to a minimum. The Needle Bearing's turned-in outer lips effectively retain lubricants to keep these precision machines running for long periods without servicing.

The Torrington Needle Bearing has become "standard equipment" on countless products throughout industry since its introduction nearly twenty years ago. Its small size and infrequent lubrication needs are of great advantage in compact, tightly encased designs.

Perhaps the Needle Bearing can solve your anti-friction problems. Our engineers will be glad to work them out with you.

THE TORRINGTON COMPANY  
Torrington, Conn., South Bend 21, Ind.



## **TORRINGTON NEEDLE BEARINGS**

Needle • Spherical Roller • Tapered Roller • Cylindrical Roller • Ball • Needle Rollers

Trade-marks of some of the business machine manufacturers whose products enjoy the benefits of Needle Bearings.



DITTO 

Diebold

IBM



Addressograph-Multigraph

Remington-Rand



Cummins-Chicago Corp.

PITNEY-BOWES



# Production Pointers from **GISHOLT**



TIME-  
SAVING  
IDEAS



*Presented as a service to production men, we hope some of these interesting ideas, chosen from thousands of jobs, will suggest ways to help you cut time and costs in your own work.*

## HIGH PRODUCTION SETUP FOR THIN-WALL PARTS

### 1 Man Tends 3 No. 12 Hydraulic Lathes on Fast, Precision Work

How to get the needed high production on tricky thin-wall parts requiring a large number of operations?

This manufacturer found the most practical solution was dividing the work among three No. 12 Hydraulic Automatic Lathes. By this method only one man is required to operate all three machines, turning out a completed part every 1.3 minutes . . . keeping costs at rock bottom.

Each No. 12 Hydraulic Lathe has the same type 12" three-jaw air chuck for holding the stainless steel ring flange. Compensating serrated jaws, grip the workpiece with support for over three-quarters of the circumference. This eliminates danger of springing the part with total pressure.

*Here's fast, precision machining of delicate parts involving 13 operations on 3 No. 12 Hydraulic Lathes—with one operator.*



Final operations are performed using live center on No. 12 Hydraulic Automatic Lathe.

### Operations are divided up this way:

**1st**—Part is held on the O.D. Turn, face, bore, counterbore and chamfer. This single operation completes the thick base section shown here.



**2nd**—Part is held on previously machined O.D. Rough turn O.D. Rough and finish turn the tapered I.D., face and chamfer. Part now looks like this.



**3rd**—Part is held on same surface and supported with a live center. Finish form the O.D., face and chamfer; part is then completed.



Ask for bulletin showing the No. 12 Hydraulic Automatic Lathe doing 28 widely different jobs which illustrate its unusual flexibility.



TIME-  
SAVING  
IDEAS

FOR MORE PRODUCTION FROM

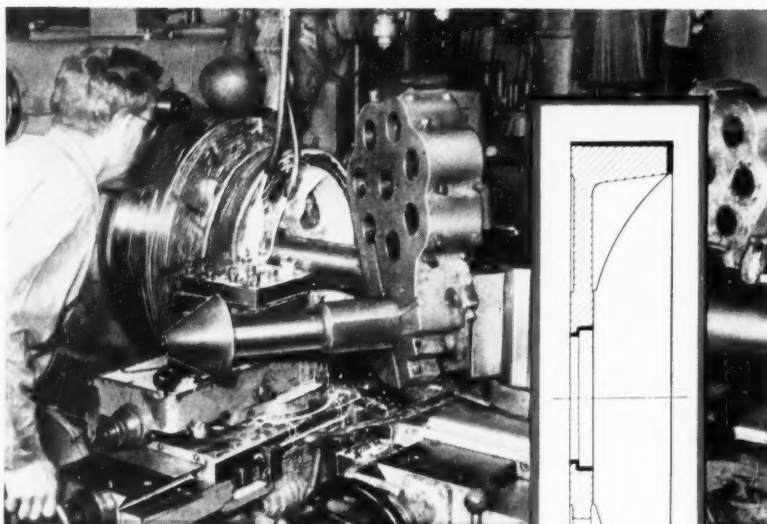
## HOW **HYSTER** COMPANY CUT COSTS IN HALF ON HEFTY PARTS

### New Saddle Type Lathe Permits Multiple Cutting at Higher Speeds

Perhaps you, too, can take advantage of sheer power and rigidity in a turret lathe to cut your costs. Hyster Company of Portland, large manufacturer of handling equipment, formerly machined these heavy drum gears on a pre-war machine. Production of the 22", 260 Brinell parts averaged an hour for the first operation.

When they put the job on a new Gisholt 4L Saddle Type Turret Lathe, floor to floor time was cut in half—with parts completed in 30 minutes. Simultaneous machining from both turrets, plus faster operating speeds—and the ability to take heavier cuts, account for the increased production.

A 28" three-jaw chuck holds the part in the cored holes in the web. Rough and finish boring, counter-boring and facing operations are handled from the cross-feeding hexagon turret. At the same time, tools on the square turret face and turn the O.D. Production is in lots of 100.



Operator Ed Davis keeps production going at top speed.

Heavy lines show machined surfaces.

An excellent example of how Gisholt power and rigidity permit multiple tooling and heavier cuts at higher speeds to save time and costs.

## FINE SETUP FOR FAST MACHINING OF BRONZE NUTS

### A No. 5 Ram Type Turret Lathe Job

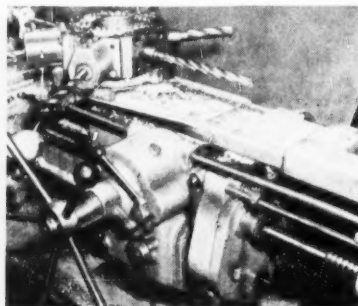
It's mostly inside work to be performed on these hard aluminum bronze castings calling for a  $\frac{7}{8}$ " hole  $2\frac{1}{4}$ " long with four t.p.i. Acme threads.

This job is set up on a Gisholt Ram Type Turret Lathe with a three-jaw scroll chuck. The square turret faces to length. Next, three successive sta-

tions on the hexagon turret start drill, drill through and bore. At the same time, the O.D. is turned from the square turret.

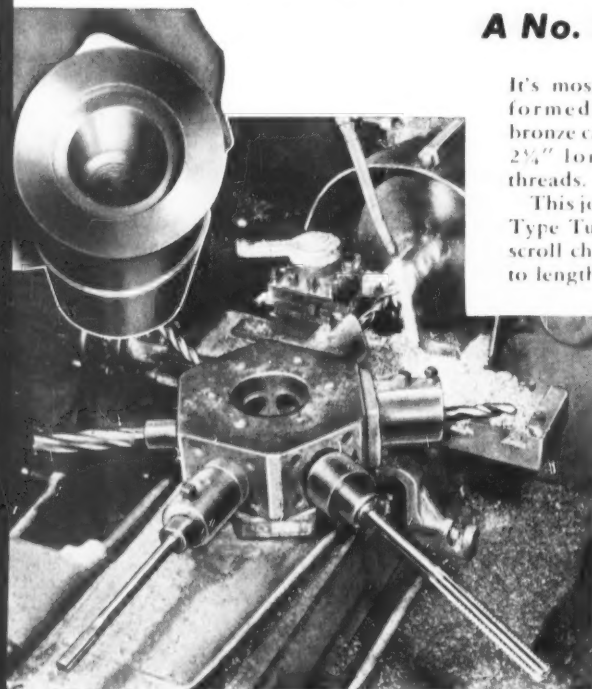
The counterbore is then made and the hole is reamed full depth from the hexagon turret. The end is then formed from the square turret. Finally, the rough, semi-finish and finish taps are used with the threading attachment on the hexagon turret.

Turret Lathe setup for bronze nuts.



This well planned tooling plus instantaneous speed changes with the Hi-Lo trip lever, keep production moving fast.

Engaging the threading attachment.



LOOK AHEAD . . . KEEP AHEAD . . . WITH GISHOLT





TIME-  
SAVING  
IDEAS

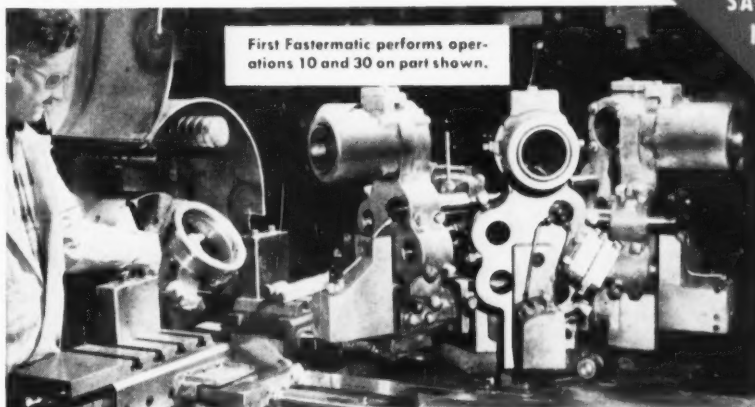
## DOUBLE TOOLING FOR 4 OPERATIONS ON 2 MACHINES

### Easy Changeover on Fastermatics Simplify Job

The question here was how to perform four separate machining operations on these steel bearings with a minimum of equipment . . . and with one operator, if possible.

Double tooling of a pair of Fastermatic Automatic Turret Lathes provided the answer. Here's how: Operations 10 and 30 are handled on the first machine, operations 20 and 40 on the other. A single operator, because of the Fastermatics' automatic cycles, is able to tend both machines.

With both sides roughed after operations 10 and 20, he makes easy changeover of the two machines for operations 30 and 40. Double tooling on both machines means simply a change of chuck jaws and some small tool holders.



As shown here, in operation 10, seven different surfaces are rough machined by tools mounted in the turret and both cross slides. Unused turret stations are by-passed. Nine surfaces are finish machined in operation 30—those already roughed out

plus an additional counterbore and a necking operation. The other machine operates essentially the same.

*With careful planning, 2 Fastermatics do double duty with minimum changeover.*

## SHOWING HOW "SPECIAL" MACHINING PROBLEMS CAN HAVE SIMPLE SOLUTIONS

### ... especially with the Simplimatic

Before machining this steel bevel drive gear, this producer had to get answers to:

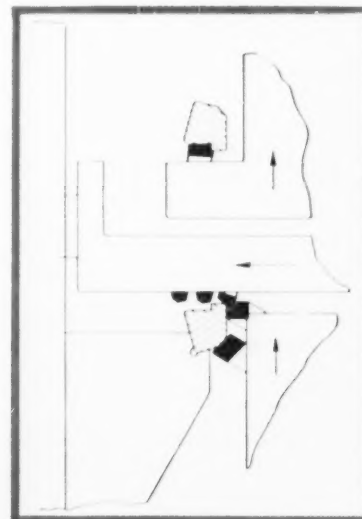
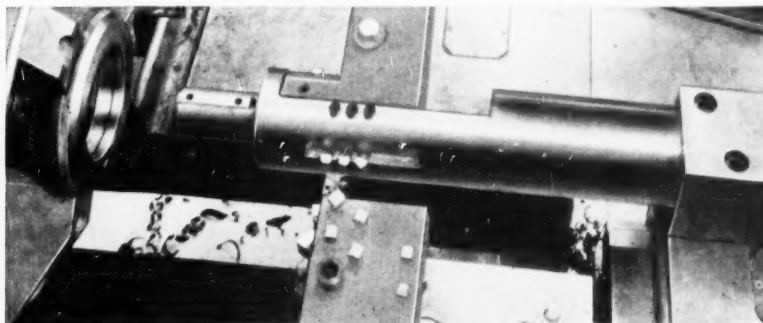
1. How to bore, face and counterbore in 1st operation . . . made more difficult because the counterbore is on the chuck side of the piece.
2. How to get two tool slides within the 4" I.D. for simultaneous boring and counterboring.
3. How to spare the expense of a special machine and elaborate tooling . . . and yet have rapid changeover to the 2nd operation.

The ready answer to all three questions was the standard Simplimatic Automatic Lathe equipped with special tool blocks on standard slides.

The front slide feeds across the part to face and break the corner. The tool on the rear slide, which back-faces and forms the counterbore, is carried on a holder recessed into the oversize boring bar, thus providing room for getting into work. This boring bar, carried on the center slide which roughs, finishes and chamfers the bore, is supported by the pilot in the spindle (see layout).

Time is only 1.5 minutes, f. t. f.

*The standard Simplimatic, with its infinite possibilities of slide and tool arrangements, avoids the need for a special and costly machine.*



◀ Note how special tool block in rear slide starts from cutaway in oversize boring bar.







TIME-  
SAVING  
IDEAS

## HOW TO MULTIPLY OIL SEAL LIFE 8 TIMES

### Woodward Governor Company Keeps Seals Oil-Tight Longer by Superfinishing

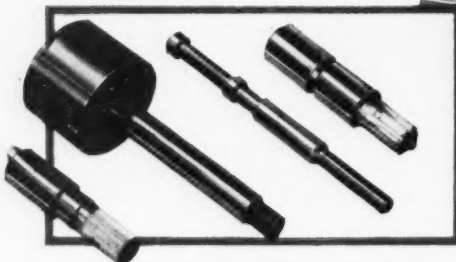
If oil seals in these diesel engine governors lose their oil-tightness, it means serious trouble: (1) Because the power piston operates in a vertical position, reciprocating action could cause loss of sump oil. Also, (2) any leakage at the main drive seal might result in engine oil contaminating governor oil and impairing its operation.

How to make the seals oil tight, and keep them that way longer? The solution was simple: by Superfinishing. It's shown in action here, at Woodward Governor Company, Rockford, Illinois.

The parts come to the Model 51-A General Purpose Superfinisher with a ground finish of 10 micro inches. After Superfinishing, they have a sur-

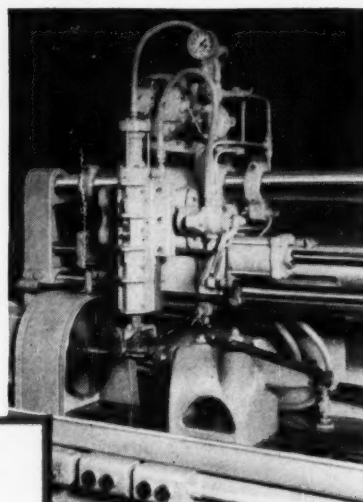
face smoothness of 3 micro inches. Production is at the rate of 40 pieces per hour—with inspection for size and finish made by the operator, while the machine goes through its automatic cycle.

*Here, at negligible cost, Superfinish assures oil-tight seals and at least 8 times longer seal life by removing all amorphous "smear metal."*

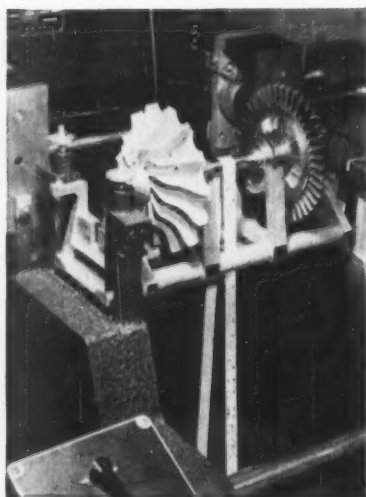


Close-up shows Superfinisher doing pilot valve of engine governor.

Superfinished components of governor: drive shaft, power piston, pilot valve, rotating bushing.



## HIGH-FLYING PARTS BALANCED TO .020 OUNCE INCHES



Note how the impeller is balanced while running in its own ball bearings.

### Direct Reading Shows Stock to Be Removed for Correction

Supercharger impellers for high-altitude aircraft call for dependable accuracy of balance.

Doing the job of assuring smooth, dependable operation is a Gisholt Type 3S DYNETRIC Balancer. The workpiece is rotated with its own ball bearings, thus duplicating normal operating conditions. Unbalance is read directly in terms of stock to be removed. This avoids errors in translating ounce inches into actual cor-

rection to be made. Stock is removed from the scallop on one end and the rotor on the other.

In a matter of seconds the entire operation—locating, measuring and correcting—is completed, and the part is balanced to an accuracy of .020 ounce inches. Gisholt Balancers are easy to set up and can be operated by average shop personnel.

*To insure lasting, vibrationless operation, balancing of impellers is made a regular part of production—with a speed and accuracy not possible on any other equipment.*

Textbook on balancing, yours for the asking. Has all the facts, helpful information. Write for "Static and Dynamic Balancing."



### Complete Balancing School

Students from more than 100 companies have already completed courses in the Gisholt Balancing School—the only training of its kind available today. Write for details, starting dates.

No. 9-1053  
580



THE GISHOLT ROUND TABLE represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

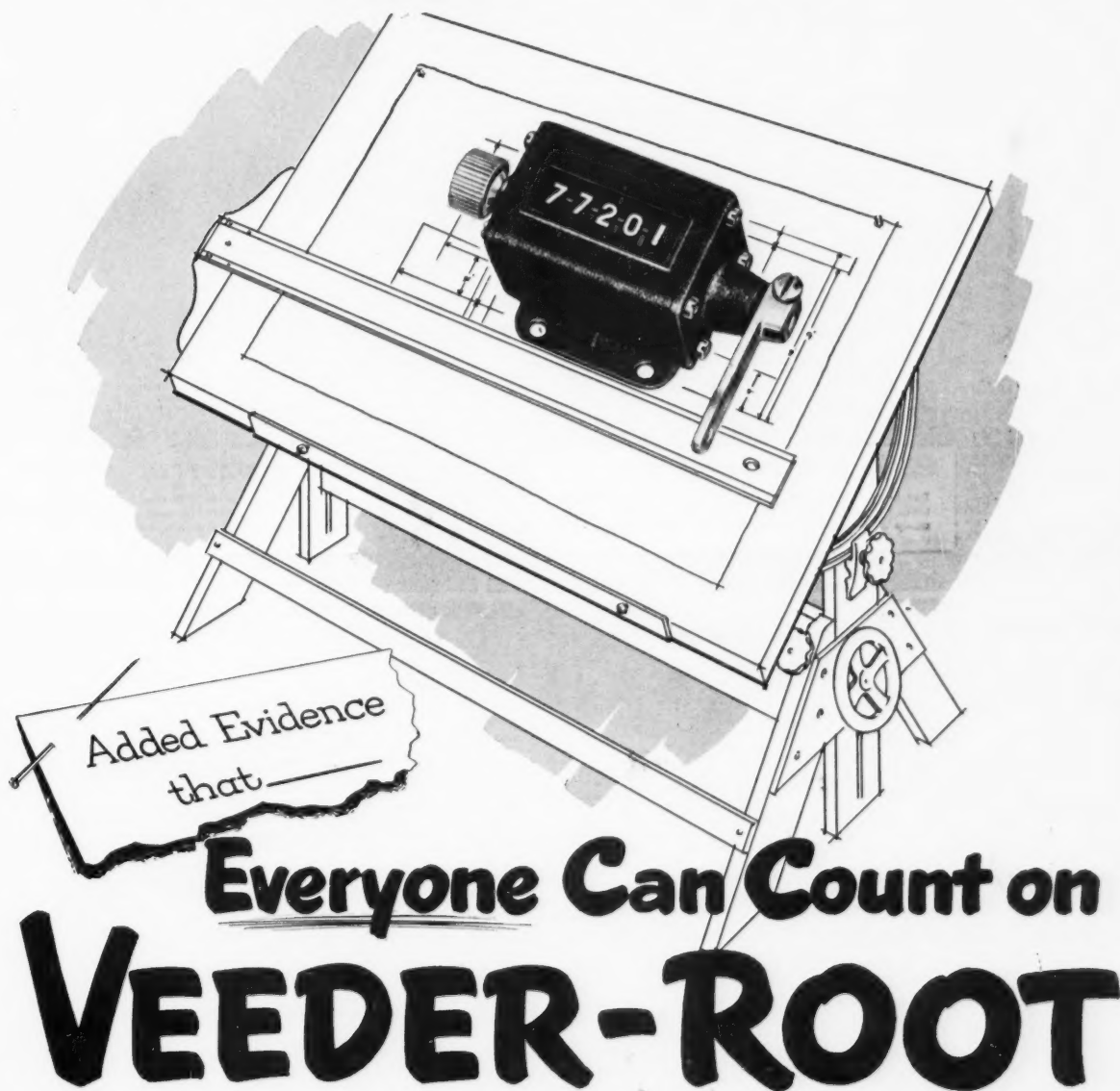
Write for your copy of Gisholt's new general catalog.

# GISHOLT

MACHINE COMPANY Madison 10, Wisconsin

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

Nothing You Build Into Your Product  
*Can Count for More!*



This compact Reset Counter, shown actual size, is a standard built-in part of many makes of business machines, cameras, coin machines, compressors, die casting machines, hay balers, laundry equipment, plastic molding machines, punch presses, shoe machines . . . and what have you? It counts turns, strokes, pieces or other units of performance and output . . . supplying facts-in-figures that help toward closer

Control. Find out how your product can give your customers a new usefulness, with these or other Veeder-Root Counters for mechanical or electrical operation. Write:

**VEEDER-ROOT INCORPORATED**  
HARTFORD 2, CONNECTICUT

Chicago 6, Ill. • New York 19, N. Y. • Greenville, S. C.  
Montreal 2, Canada • Dundee, Scotland  
Offices and Agents in Principal Cities



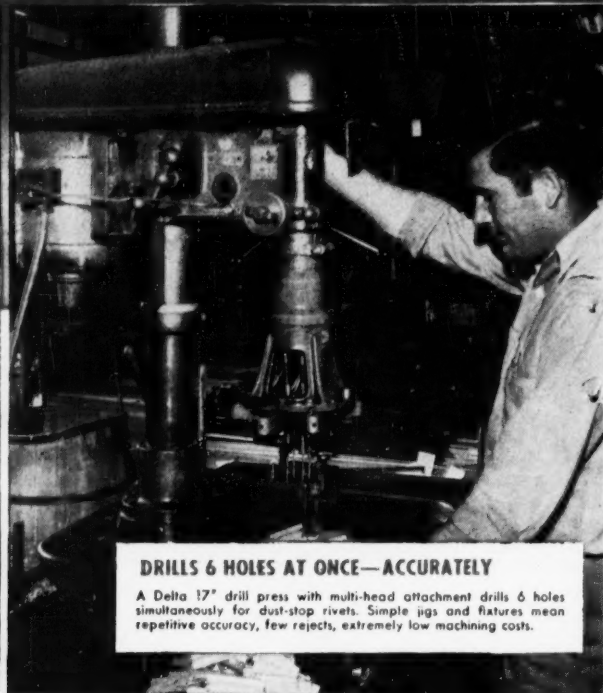
*"The Name that Counts"*

# USING 21 DELTA DRILL



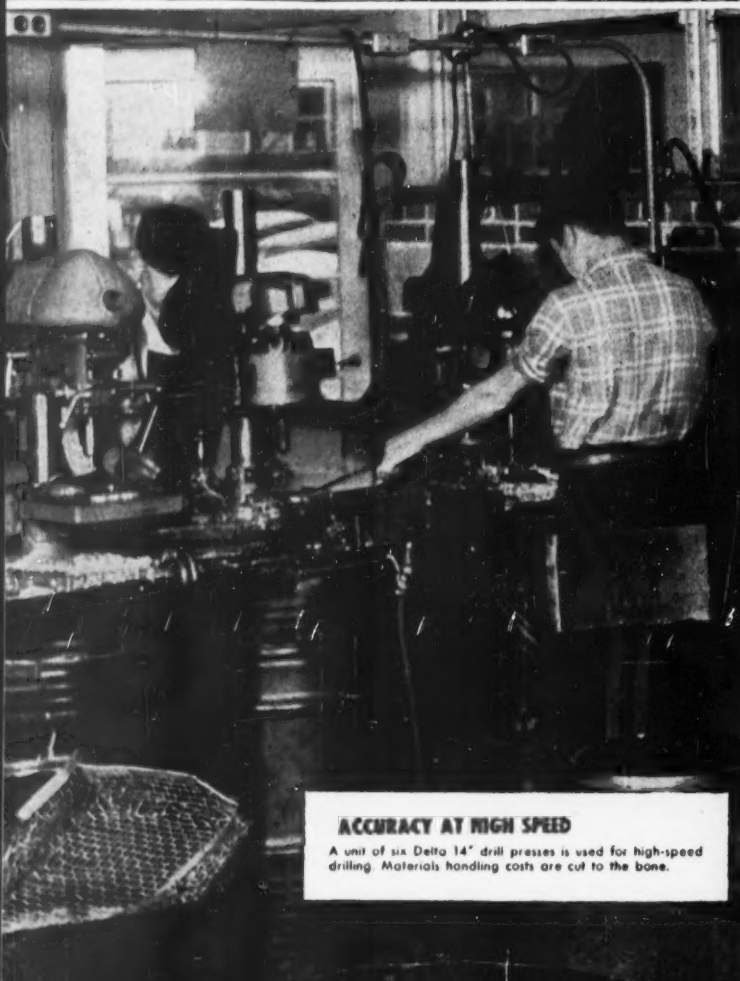
## ONE OPERATOR, TWO MACHINES

Two Delta 14" drill presses operate in a fixture with collapsible tubes for adjusting the distance between holes and with an air clamp which operates automatically when the drill lever is pulled.



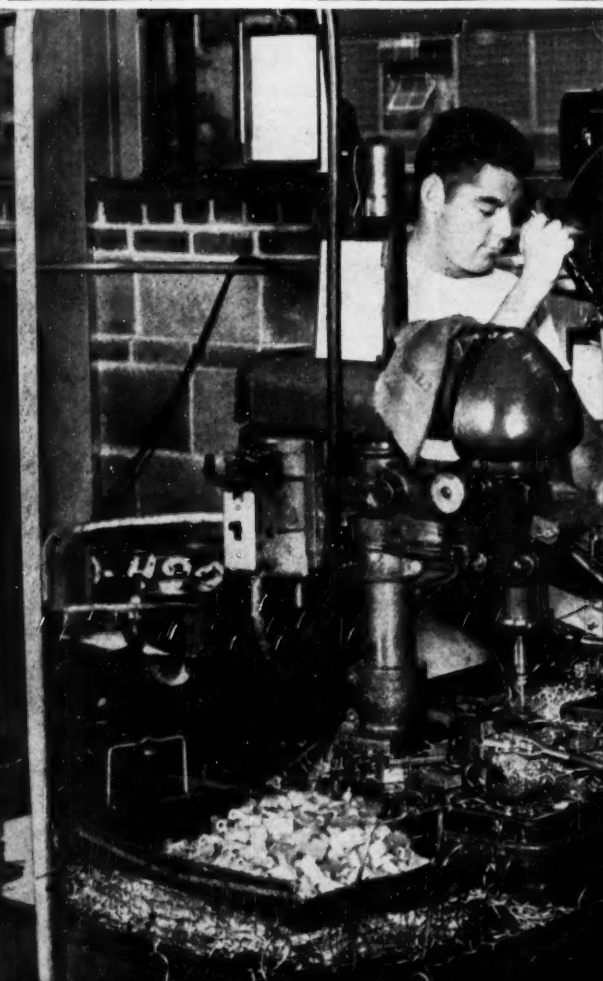
## DRILLS 6 HOLES AT ONCE—ACCURATELY

A Delta 17" drill press with multi-head attachment drills 6 holes simultaneously for dust-stop rivets. Simple jigs and fixtures mean repetitive accuracy, few rejects, extremely low machining costs.



## ACCURACY AT HIGH SPEED

A unit of six Delta 14" drill presses is used for high-speed drilling. Materials handling costs are cut to the bone.





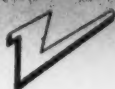
# PRESSES, CUPPLES PRODUCTS CORP.



ELIMINATES SET-UP CHANGES...



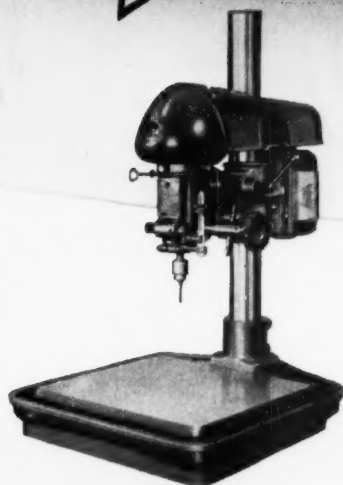
MAINTAINS INCENTIVE DIRECT LABOR EFFICIENCY...



SPEEDS PRODUCTION!

*Plus*

*gaining these added benefits that increase work flow:*



- ▼ Less Materials Handling
- ▼ Greater Flexibility—  
Move the Tools to the Job,  
or the Jobs to the Tools
- ▼ Easier Operating Training
- ▼ Direct Savings in Labor Costs
- ▼ Negligible Maintenance

For less than the cost of one major machine tool, Cupples Products Corp. bought 21 Delta drill presses, spotted them at key points in their production line and got the results listed above.

Isn't it "good business" to examine your own shop procedure and see if the Cupples plan won't work for you? It has in hundreds of plants. Ask your dealer about Delta tools—sturdy, light, accurate, versatile, mobile and best of all, very inexpensive.

Your Delta dealer is listed in the yellow pages of your phone book under "Tools" or "Machinery." If you'd like catalog AB52, which describes the complete Delta line, ask him for a copy—or write to: Delta Power Tool Division, Rockwell Manufacturing Co., 614J North Lexington Ave., Pittsburgh 8, Pa.

**DELTA** QUALITY POWER TOOLS

Another Product by **Rockwell**

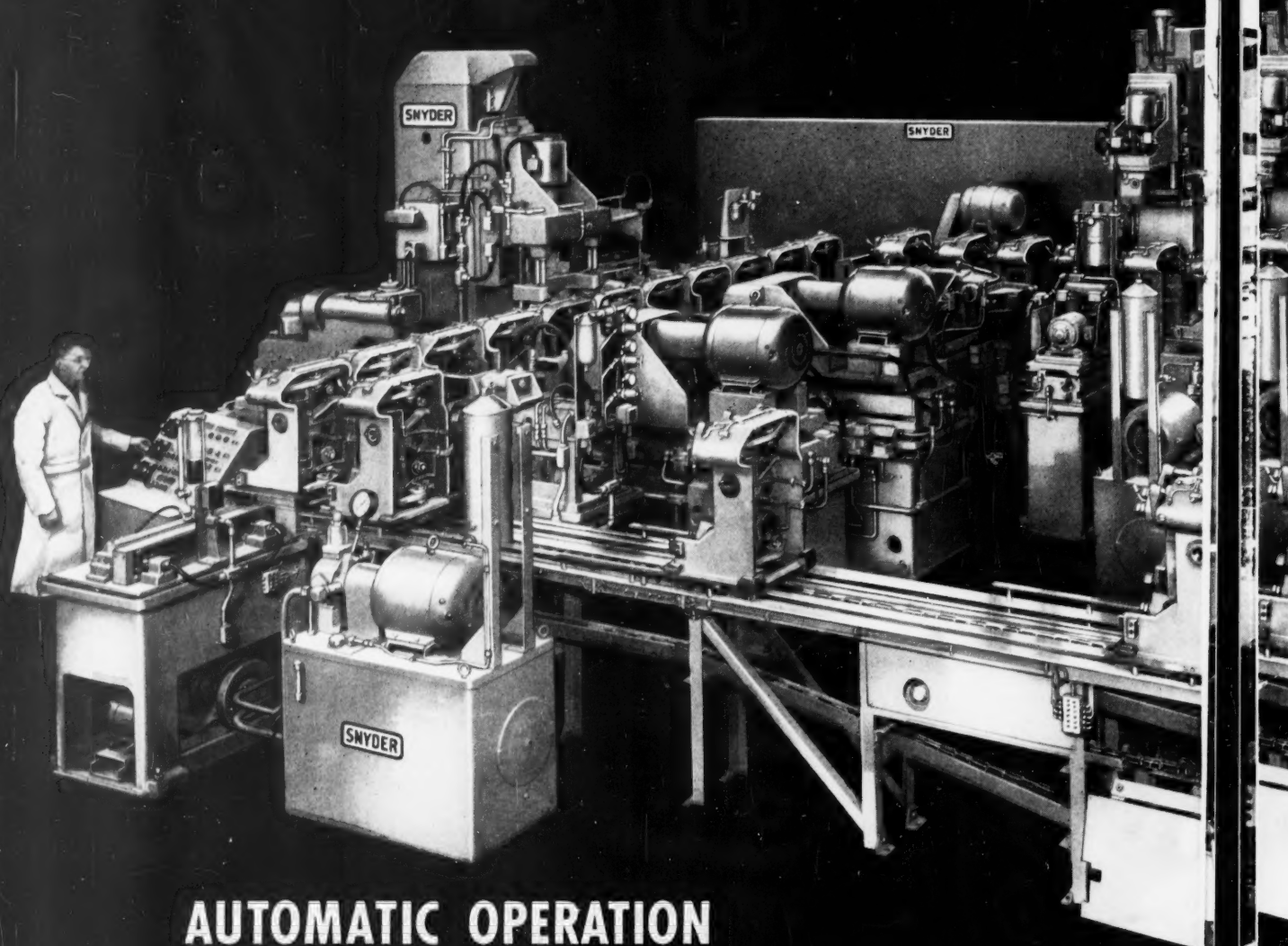


Delta Quality  
Makes the Difference





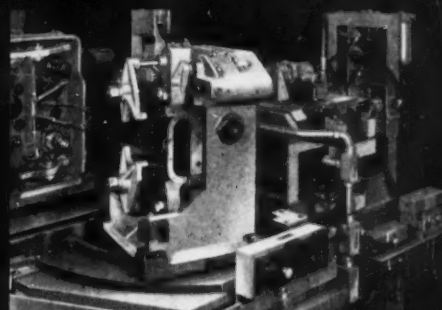
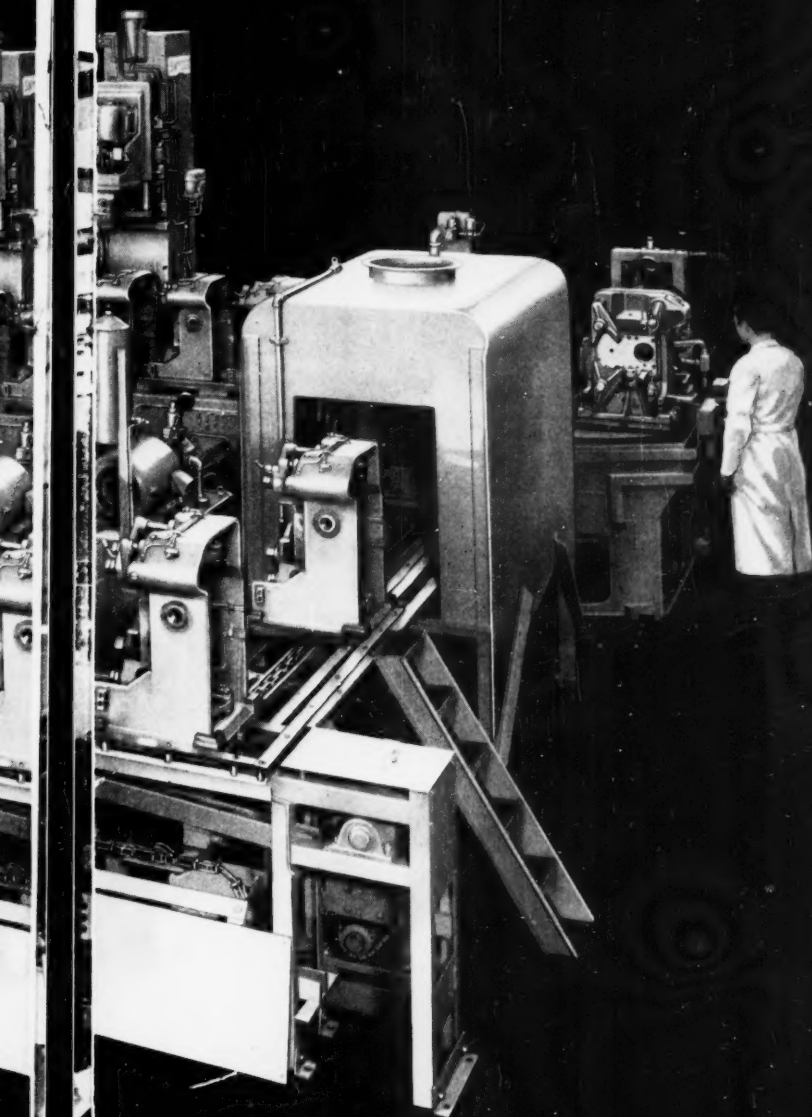
# **SNYDER MACHINES CONTROL COSTS**



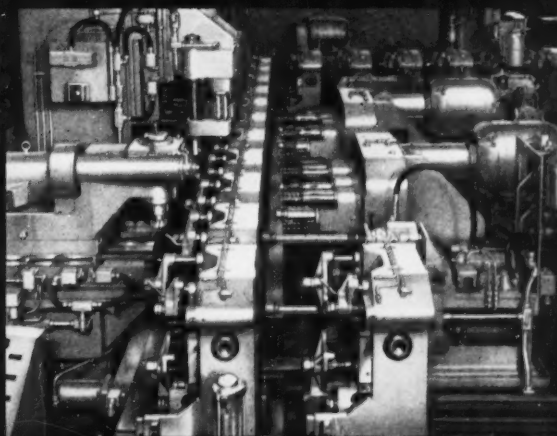
## **AUTOMATIC OPERATION**

MILLS, DRILLS, TAPS, BORES, COUNTERBORES,  
COUNTERSINKS FRONT COVERS FOR AUTOMOTIVE  
ENGINES • AUTOMATIC INDEXING, LOCATING, CLAMPING,  
AND RELEASING • AUTOMATIC TRANSFER THROUGH  
TWO-STAGE, CONTINUOUS WORK CYCLE • AUTOMATIC  
CONTROLS • AUTOMATIC SAFETY INTERLOCKING SYSTEM  
• AUTOMATIC LUBRICATION • AUTOMATIC CLEANING  
AND CHIP REMOVAL • SKILLED OPERATORS NOT NEEDED

**18** STATION AUTOMATIC TRANSFER  
**180** FRONT COVERS AN HOUR AT 100% EFFICIENCY



At Station 18 the fixture is rotated 90°, air wrenches unclamp the part so that it is easily removed. The fixture returns to Station 18, engages the return conveyor, is automatically blown clean and returned to the loading station.



Fixtures leaving Section 1 (above) move at right angle so that the other faces and top of the part are exposed to tools. The part enters the work cycle with three ground faces, leaves it ready for assembly.

# SNYDER

TOOL & ENGINEERING COMPANY

*28 Years of Successful Cooperation with Leading American Industries*

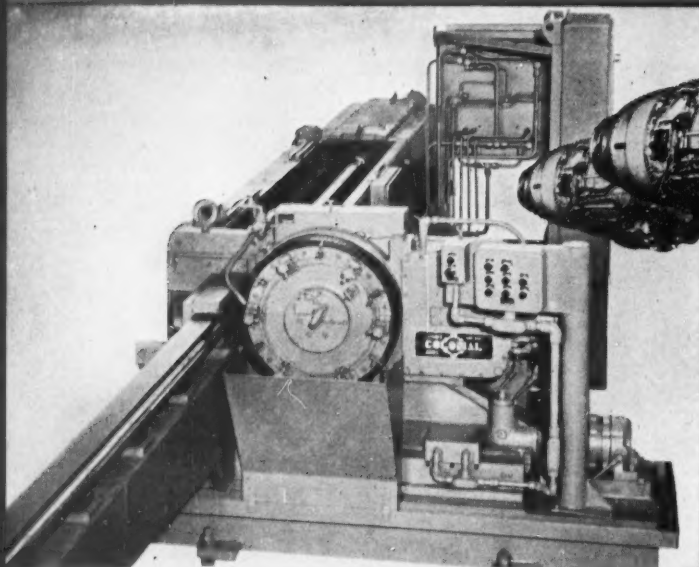
3400  
E. LAFAYETTE

★  
DETROIT 7,  
MICHIGAN

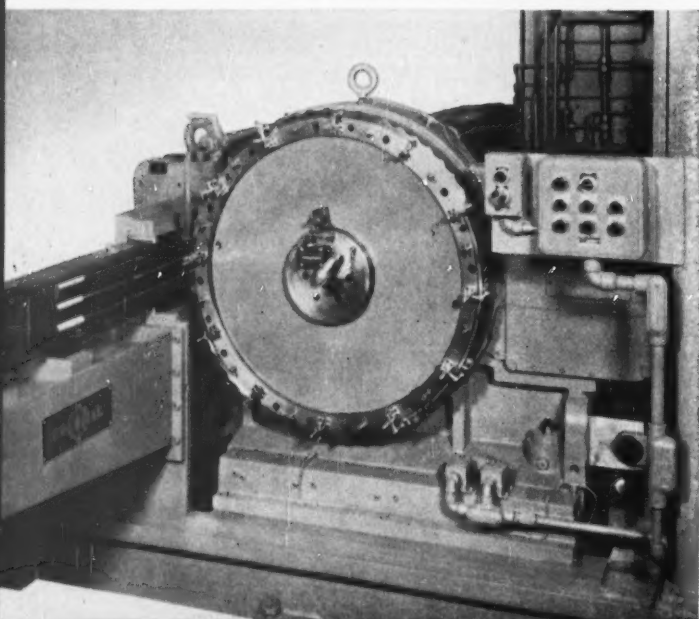


COLONIAL broaching machine, 10-ton 90-inch stroke horizontal, with trunnion fixture for angular adjustment. Shuttling, indexing, ram operation, and rapid return fully automatic, for broaching internal slots on Curtiss-Wright SAPPHIRE ring segments. Pneumatic part ejection manual control.

## COLONIALS *in the Shop* MEAN



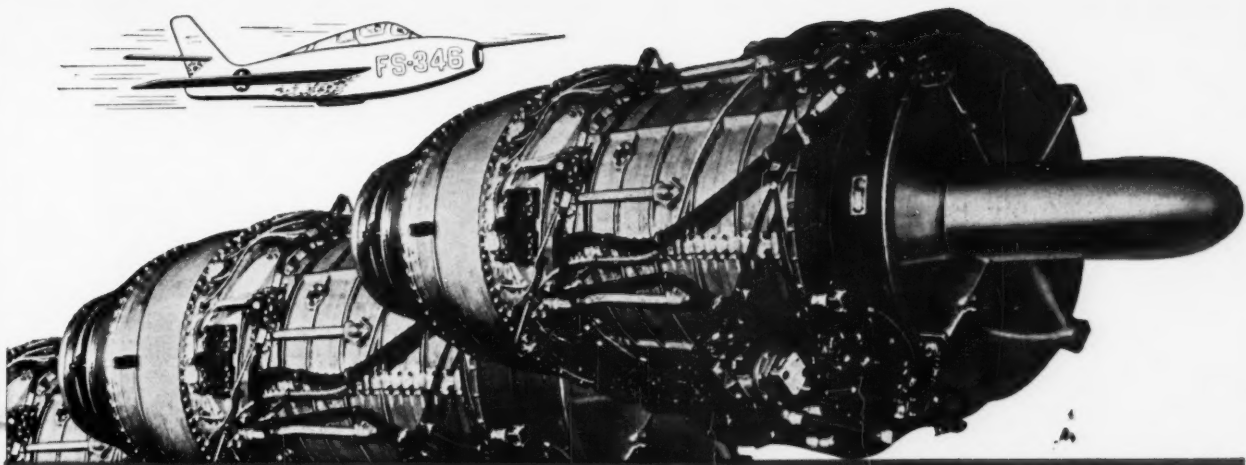
Another fully automatic COLONIAL 10-ton 90-inch stroke horizontal broaching machine broaches external slots on a SAPPHIRE jet engine part. Again, shuttling, indexing and ram operation are automatic, and part ejection is pneumatic manual control.



Three external scallops on this Curtiss-Wright SAPPHIRE part are broached automatically with each stroke of the ram, on this 10-ton 60-inch stroke COLONIAL broaching machine. Like the other machines shown, electrical controls permit individual operation of each function for set-up and tryout purposes.







# **MORE** CURTISS-WRIGHT *SAPPHIRES in the Air*



These drawings, distorted for security reasons, indicate the types of jet engine parts being produced automatically today on COLONIAL broaching machines with 'unified' broaching.

**C**OLONIAL BROACH is proud to be a supplier of broaching machines to the Curtiss-Wright Saphire jet engine program. This 25% more powerful jet fighter engine has gone into production in record breaking time, and record breaking production will be possible due to the high production accuracy of machine tools like the fleet of automatic Colonial broaching machines, complete with Colonial broaches and fixtures, working on this program.

"Always ready for flight" is the reputation established by SAPPHIRES at the Air Force's principal flight test base. "Always ready for broaching" is the reputation established by COLONIALS in leading production shops of America. This reputation can be traced to Colonial's 'unified' broaching, made possible by designing and producing the broaching machine, the broaches, the fixtures, and the automation, all in Colonial's own plant, and all serviced by Colonial in the production shop.







*Takes on  
all comers!*

This 42-72-84 Blanchard Surface Grinder is used for machining many sizes of torch cut steel plates. As the first operation after cutting, Blanchard grinding removes the proper depth of stock as required, frequently up to  $\frac{1}{8}$ " per side, producing surfaces accurately flat and parallel for laying out or further machining.

Work up to 7 feet across corners is regularly ground on this machine. In spite of its size, this grinder is as easily controlled as the smaller Blanchard grinders.

Typical of work produced is the 48" x 48" x 10" machine steel, die mounting plate, at left. 58 cu. in. of stock (.025" per side) is ground off in one hour and 35 minutes, floor to floor, with flatness held to .001". Note the magnetic hoist—a good tip for loading and unloading the Blanchard quickly.

Regardless of your requirements for stock removal, tolerances or surface finish, Blanchard has the grinder and grinding wheel to do each job best.

**PUT IT ON THE**  
**THE BLANCHARD MACHINE COMPANY**



Send for your free copies of "Work Done on the Blanchard," fourth edition, and "Art of Blanchard Surface Grinding."



**64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.**

# SO SIMPLE

**NO PINS • NO PIVOTS • NO BEARINGS**

## No Wonder There's No Trouble

In any device it's the moving parts that are the troublemakers. The more moving parts . . . the more chances for trouble.

Most motor starters have lots of moving parts like pins, pivots, bearings, and linkages. But . . . Allen-Bradley Bulletin 709 solenoid starters and contactors have **ONLY ONE MOVING PART** . . . the solenoid plunger which carries the movable contacts. No switch could be simpler . . . nor more trouble free. The silver alloy contacts need no filing or dressing. They are always in good operating condition.

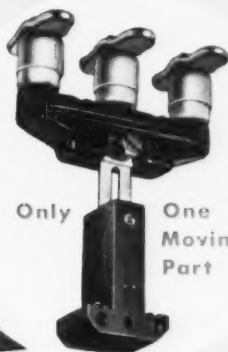
The Bulletin 709 general purpose enclosures, shown below, have a bonderized, black enamel exterior finish that is corrosion resistant. The white interiors make installation and inspection easy in dark places. All switch parts have a "quality" finish. In fact, you cannot buy better "quality looking" control.

Special enclosures are available for every kind of service condition. These across-the-line starters can also be furnished in "open type," without enclosures, for mounting in machine base. Let us send you our catalog!

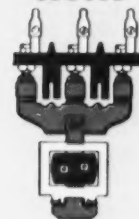
**CONTACTOR  
OPEN**



Only One Moving Part



**CONTACTOR  
CLOSED**



### COMPLETE LINE

Allen-Bradley Bulletin 709 Across-the-line Starters are listed for 3-phase motors up to 600 hp, 440-550 v. All starters have accurate relays for overload protection.



*Send for Illustrated Bulletin*

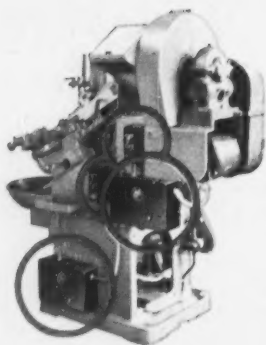
Allen-Bradley Co., 1316 S. Second St.,  
Milwaukee 4, Wis.

# ALLEN-BRADLEY

QUALITY

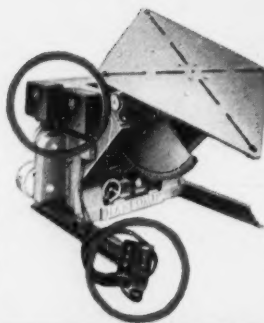
**TROUBLE FREE MOTOR CONTROLS**

7-53-M2

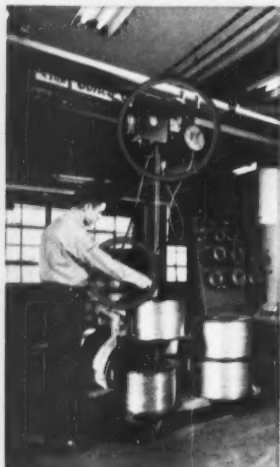


Two Allen-Bradley Bulletin 705 solenoid operated reversing switches on Waterbury-Farrel screw thread rolling machine.

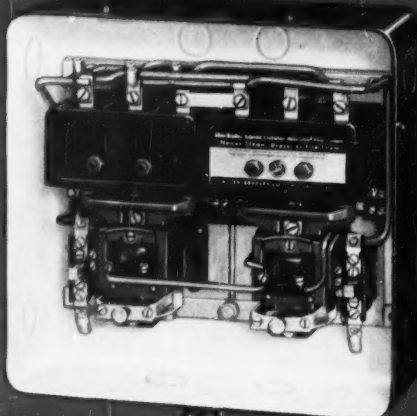
Two Allen-Bradley Bulletin 705 reversing switches on Ransome welding positioner. Push button stations are attached to flexible control cable.



Morris-Wheeler pillar type jib crane equipped with Allen-Bradley Bulletin 705 reversing switch to control the horizontal swing of the crane.

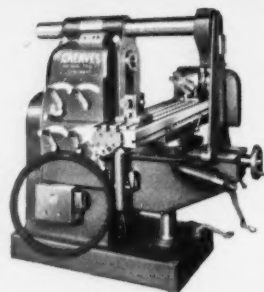


Bulletin 705 reversing switch on Conco 1/4 ton electric hoist for lifting copper wire reels in wire mill.



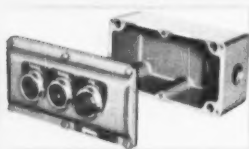
Bulletin 705, Size 2, Reversing Switch.

Bulletin 705 reversing switch for Greaves No. 2 milling machine. Master push button station is at top of the milling machine.



Mercer materials handling hoist equipped with Allen-Bradley Bulletin 705 reversing switch.

## TROUBLE FREE REVERSING SWITCHES for 1001 APPLICATIONS



### OILTIGHT CONTROL STATIONS

Bulletin 800T oiltight push button stations for reversing control are available in many combinations of push buttons... normally open or normally closed... with or without pilot lights... in any horizontal or vertical arrangement.

When you have an application for reversing controls, make the installation trouble free by installing Allen-Bradley Bulletin 705 reversing switches. These solenoid operated switches are mechanically and electrically interlocked for complete safety to man, motor, and machine.

Bulletin 705 reversing switches have maintenance-free silver alloy contacts. Accurate and dependable relays protect the motor against overload. Can also be furnished without overload protection. Enclosures are available for every kind of waterproof, dustproof, and explosion-proof service.

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.

7-53-R



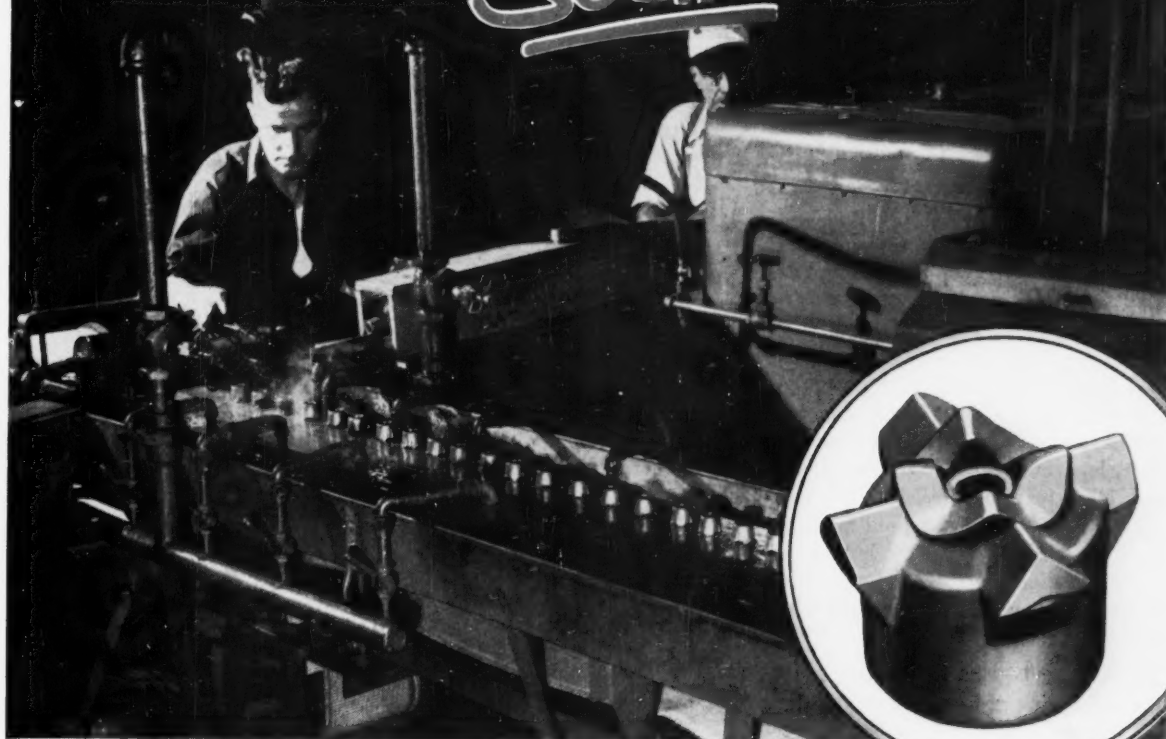
# ALLEN-BRADLEY

BULLETIN 705 REVERSING SWITCHES

QUALITY

**PRODUCTION**

**Soars 240%**



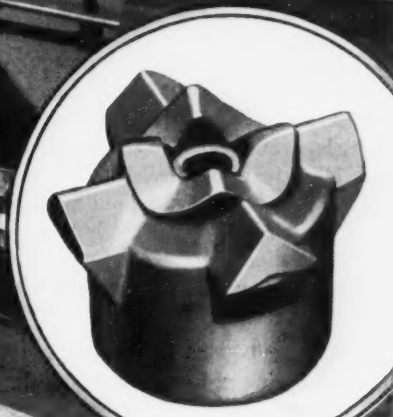
## with TOCCO\* Induction Heating

**PRODUCTION UP.** When Thompson Products Ltd., St. Catharines, Ontario switched from conventional hardening methods to TOCCO Induction hardening production of their mine drill bits increased from 250 to 600 per hour!

**COSTS DOWN.** While production skyrocketed, costs fell—from \$7.46 per hundred parts to \$6.50, a savings of almost exactly one cent per part on the hardening operation alone.

**OTHER ADVANTAGES.** Moreover, additional savings resulted from not having to haul the forged drill bits to and from the heat-treat department. Cool, clean TOCCO fits right in the production line—takes only ¼ the space of rotary hearth furnace previously used.

In Canada or United States TOCCO Engineers are glad to survey your operations for similar cost-cutting results—no obligation, of course.



*This Mine Drill Bit is made of .90 carbon drill steel. Cutting face is hardened to 65 R. C. Thompson also uses TOCCO to heat stock for forging these parts.*

**THE OHIO CRANKSHAFT COMPANY**



# TOCCO

\*Trade Mark Reg.  
U. S. Pat. Off.

**NEW FREE  
BULLETIN**

**Mail Coupon Today**

**THE OHIO CRANKSHAFT CO.**  
Dept. M-9, Cleveland 1, Ohio

Please send copy of "Typical Results of TOCCO Induction Hardening and Heat Treating".

Name

Position

Company

Address

City  Zone  State

For more information on products advertised, use Inquiry Card, page 239

MACHINERY, September, 1953—45



# 13 Key Moore Tools help put the **PRECISION** in Harig Dies



KARL HARIG

"When owner-management invests its money in machinery," says Karl Harig, founder and president of Harig Manufacturing Corporation, "it does so only after a thorough analysis and careful selection of available equipment." So it's significant that Harig, one of America's foremost producers of carbide, lamination, progressive, stamping and other types of precision dies, employs 13 Moore precision-built machine tools for many of its most critical tool-room operations.

A trip through Harig's modern Chicago plant reveals:

**3 MOORE JIG BORERS**, for accurate locating and boring of holes in a fraction of the time required by other means;

**6 MOORE JIG GRINDERS**, for relocating and grinding of holes and contours—within tenths—after hardening;

**3 MOORE PANTO-CRUSH WHEEL DRESSERS**, for speedy, cost-cutting performance of both crush-forming and diamond-dressing on the wheel spindle of a surface grinder;

**1 MOORE DIE FLIPPER**, for "mechanized" die tryouts and assembly.

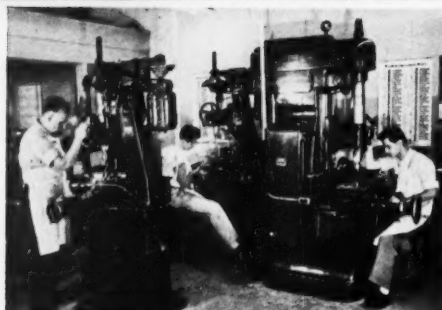
The combination of Harig craftsmanship and Moore precision tools has been an important factor in Harig's successful effort to meet continuing demands for faster production of intricate dies, tools, jigs, fixtures and gauges.

Why not discover how Moore tools can bring more speed and greater accuracy to your toolroom. Write today for our detailed literature.

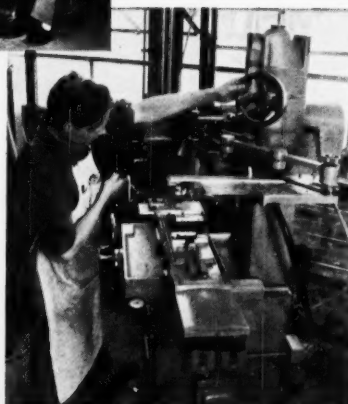
**Moore Special Tool Company, Inc.**  
734 Union Avenue, Bridgeport 7, Connecticut



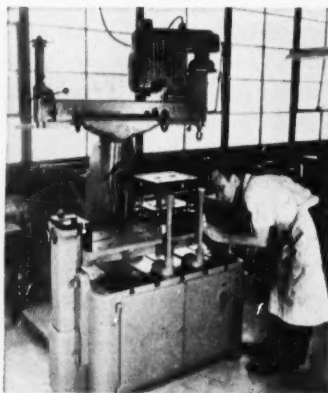
A battery of six Moore Jig Grinders performs precision internal and contour grinding operations on sectional die parts at the Harig plant.



Three rugged Moore Jig Borers handle the bulk of Harig's critical spotting, drilling, boring and reaming operations.



Harig uses this Moore Panto-Crush Wheel Dresser on a surface grinder for fast pantograph profile grinding. Harig also has two more of these cost-cutting units.



A Moore Die Flipper facilitates accurate die tryouts and assembly at Harig, replaces time-consuming hand-labor methods.

## ADD TO YOUR TOOLROOM

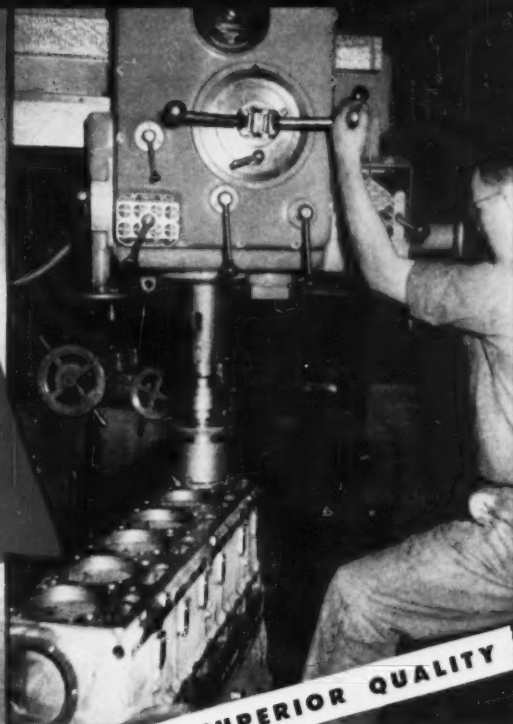
JIG BORERS • JIG GRINDERS • PANTO-CRUSH WHEEL DRESSERS • DIE FLIPPERS • MOTORIZED CENTERS • HOLE LOCATION ACCESSORIES

see our catalog in

**MACHINE  
TOOL  
CATALOGS**

or write for copy

The 2 are  
inseparable—



END PRODUCTS OF SUPERIOR QUALITY

REQUIRE SUPER QUALITY EQUIPMENT

TO PRODUCE THEM . . .

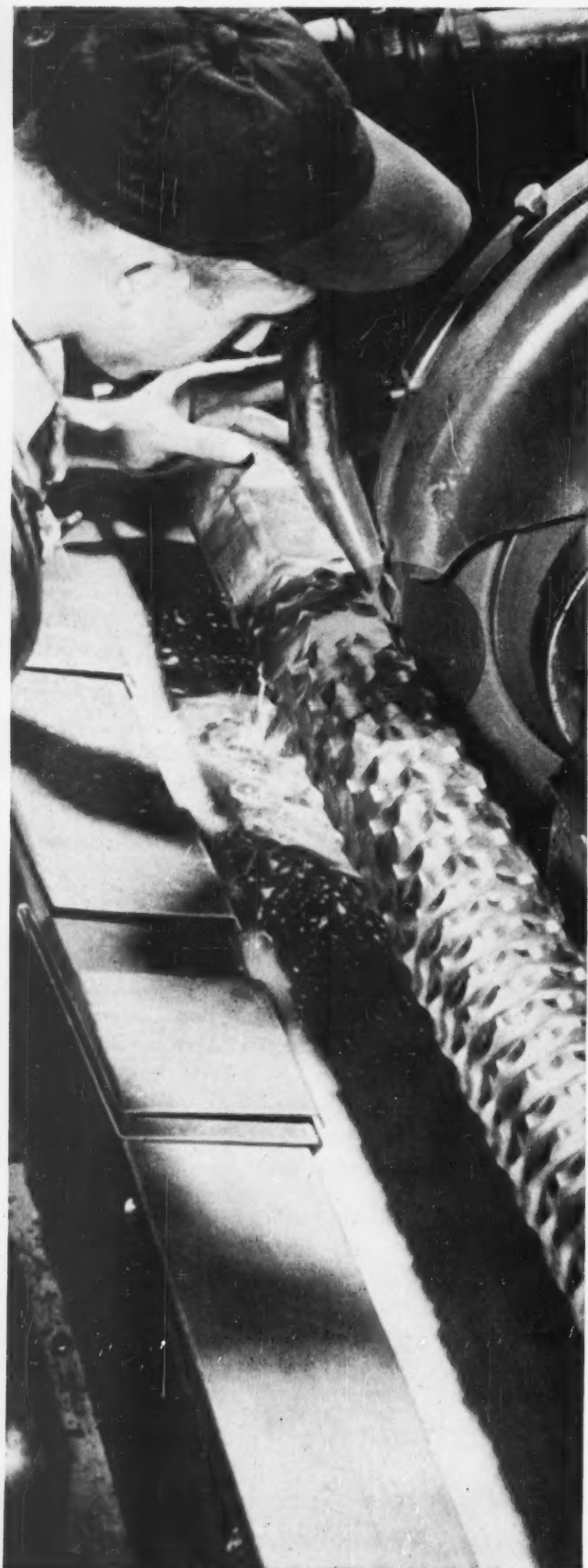
For six years this "AMERICAN" Hole Wizard Radial has been counterboring "Cummins" Diesel Engine Blocks and holding the required depth tolerance of .001" in the 6.125" counterbores. Furthermore, the operator testifies to the fact that the machine is convenient and easy to operate and maintenance has been negligible.

The quality of "Cummins" products is universally recognized. We are proud indeed that so many "AMERICAN" Lathes and Radial Drills contribute to it.

THE AMERICAN TOOL WORKS CO.

Cincinnati 2, Ohio, U. S. A.

LATHES AND RADIAL DRILLS



**PROOF that  
O.D. grinding  
gets the  
“TOUCH  
of  
GOLD”  
with Norton  
G BOND  
wheels**

... "Gave more than three times as many pieces per dressing."

... "Requires less truing and lasts 30 per cent longer."

... "Free cutting, excellent finish, considerably reduced grinding time."

... "Formed easily, held shape and removed .078" per plunge cut."

"Best Wheel Ever Used," reported by a user of Norton G Bond Wheels for cylindrical grinding, sums up the industry-wide verdict.



Reports like these are coming in fast from our O. D. grinding customers using Norton G Bond wheels. Throughout the entire range of cylindrical and centerless grinding jobs these new wheels are chalking up truly sensational records for more units per dressing, per hour and per wheel.

That's because the new G Bond, especially designed for precision and semi-precision grinding, is the most efficient vitrified bond ever developed. Wheels made with it are assured of constant, fresh, sharp cutting surfaces because of its unique ability to hold each abrasive grain *just long enough* for maximum cutting action.

#### Advantages That Pay Off

When you, too, try G Bond wheels you'll find they cut cooler . . . remove material faster . . . produce a better finish . . . produce more pieces per dressing . . . hold shape longer . . . and crush-true more easily. Then you'll know you've added the real production-boosting, cost-reducing "Touch of Gold" to every O. D. grinding job you do.

#### Ask Your Norton Distributor

for on-the-job proof of what G Bond wheels can do for your O. D. grinding. He'll gladly arrange a test in your plant. Or write to NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities — listed under "Grinding Wheels" in your telephone directory yellow pages. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Massachusetts.

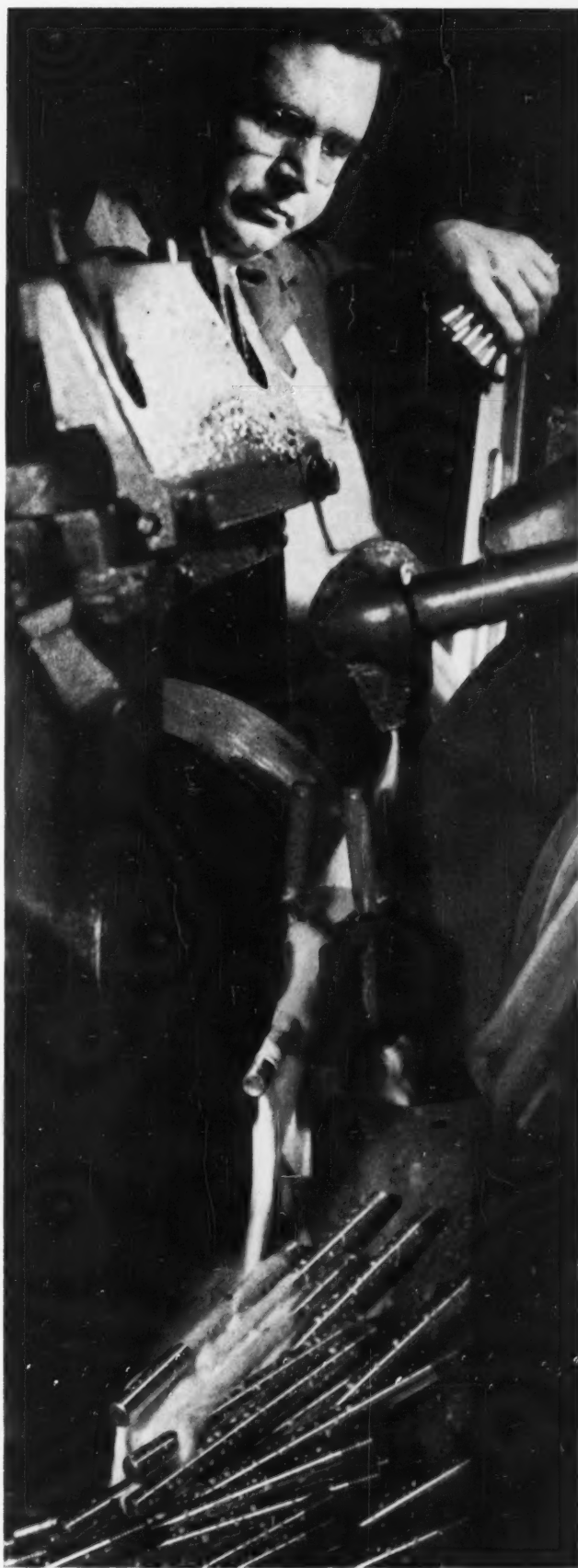
W-1510



*Making better products...  
to make other products better*

"G Bond Wheels Cut Faster, with twice as many pieces per dressing," says a customer reporting on a centerless grinding application.

For more information on products advertised, use Inquiry Card, page 239



MACHINERY, September, 1953—49



# COST REDUCTION

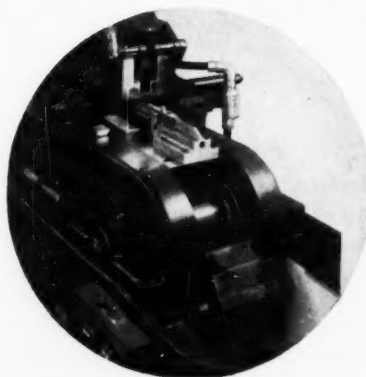
thru  
*faster*  
continuous  
broaching  
of multiple  
parts



• Wherever metal is removed on duplicate small parts you are apt to find a place where Footburt Surface Broaching Machines can cut manufacturing costs. Production is high, and tool maintenance is low in cost per piece. We have had many years of experience in designing the tooling for various types of parts and will gladly advise you in applying surface broaching to your work.

**THE FOOTE-BURT COMPANY • Cleveland 8, Ohio**

Detroit Office: General Motors Building



• Holding fixtures are designed for quick, convenient loading, with automatic clamping and unclamping.



# FOOTBURT

## M A C H I N E T O O L S

# FARVAL SPRAY VALVES save 95% of lubricant and do 100% better job

**C**OUNT the number of open gears on your machines. Multiply the amount of grease required for these gears by 95% and you'll have the savings in lubricant alone which Farval Spray Valves can bring.

Even more important than lubricant saving, the Farval Spray Valve spreads and maintains a uniform thin film of oil or grease evenly over all bearing areas—eliminates friction, increases efficiency, lowers power costs, reduces wear.

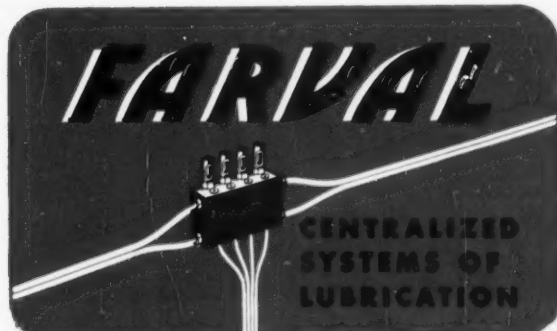
The Farval Spray Valve System is designed especially for lubricating open gearing and slide surfaces. Using an adaptation of the familiar Dualine Valve, this system sprays oil or grease from nozzles in just the right amount and at any desired interval.

No more wasteful hand paddling of lubricant on gear teeth with the hope it will spread itself uniformly. No more blobs of grease splotching up the floor—creating safety hazards. The Farval Spray Valve System has proved it can maintain a clean, even film of lubricant at all times while machines are in operation. No waste. No mess. No trouble.

Farval Spray Valves can be inserted in a regular Farval Dualine System wherever compressed air is available. Or a complete Farval Spray Valve System may be installed, consisting only of Spray Valves served by a manual or automatic pumping unit. As indicated in the sketch at right, compressed air is directed through the Spray Valve, which meters air to the delivery nozzle at the same time that the lubricant is metered. Positive cut-off after delivery eliminates bleeding.

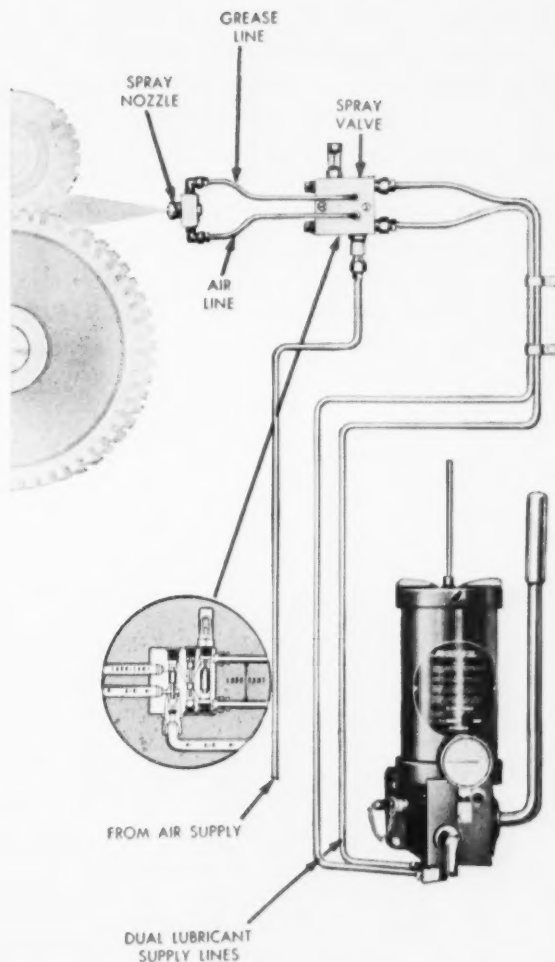
Why not insure that your open gearing and slide surfaces get the lubrication they need? Write for a copy of Farval Spray Valve Bulletin No. 60 today. The Farval Corporation, 3276 East 80th Street, Cleveland 4, Ohio.

*Affiliate of The Cleveland Worm & Gear Company, Industrial Worm Gearing. In Canada: Peacock Brothers Limited.*



For more information on products advertised, use Inquiry Card, page 239

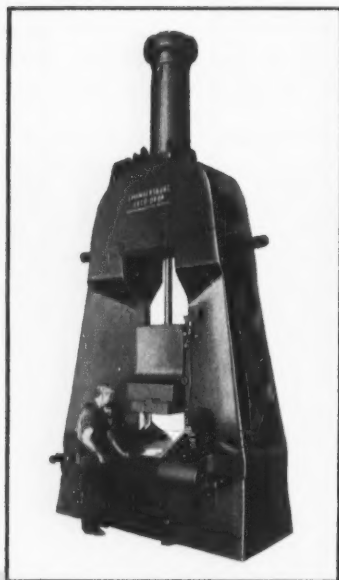
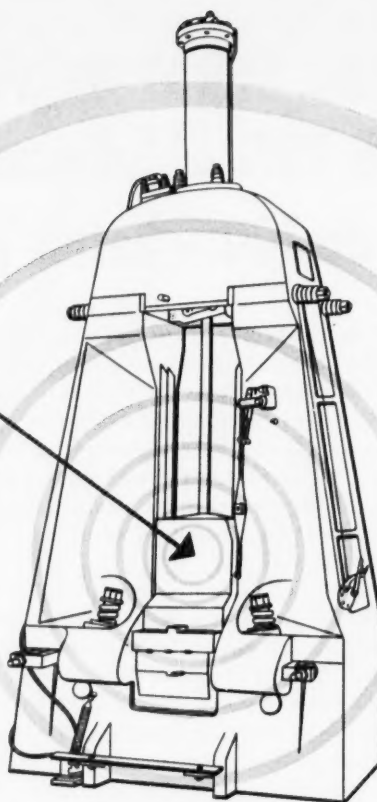
## FARVAL—Studies in Centralized Lubrication No. 149



Drawing shows component parts of the Farval Spray Valve Centralized System of Lubrication—manual pumping station, dual lubricant lines, compressed air line, single Spray Valve and nozzle. Both automatic and manual systems installed three years ago are in operation today, prolonging gear life, saving labor and lubricant.

# CENTER OF GRAVITY AT POINT OF IMPACT

- • • The center of gravity of the CECO-DROP concentrates the forces toward the base and gives a more effective blow.
- • • The center of gravity of the whole hammer approximates the center of gravity of the ram at the point of impact minimizing the fight between the ram and the other parts of the hammer.
- • • The resultant maintenance of die alignment assures fewer rejects and higher production in comparison with other types of forging hammer. This is an outstanding difference between CECO-DROPS and other hammers.



## CECO-DROP PISTON LIFT GRAVITY DROP HAMMERS

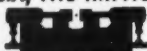
are the result of more than a half century of experience in the design and manufacture of hammers. They cost less to operate. There are no board changes, no friction adjustments, and lubrication is automatic. Treading the Ceco-Drop is easy and not fatiguing, and die alignment is held. The unique stroke adjustment and short stroke control afford a wide range of operation. Ask for our Bulletin 11-L-O.

CHAMBERSBURG ENGINEERING CO. • CHAMBERSBURG, PA.

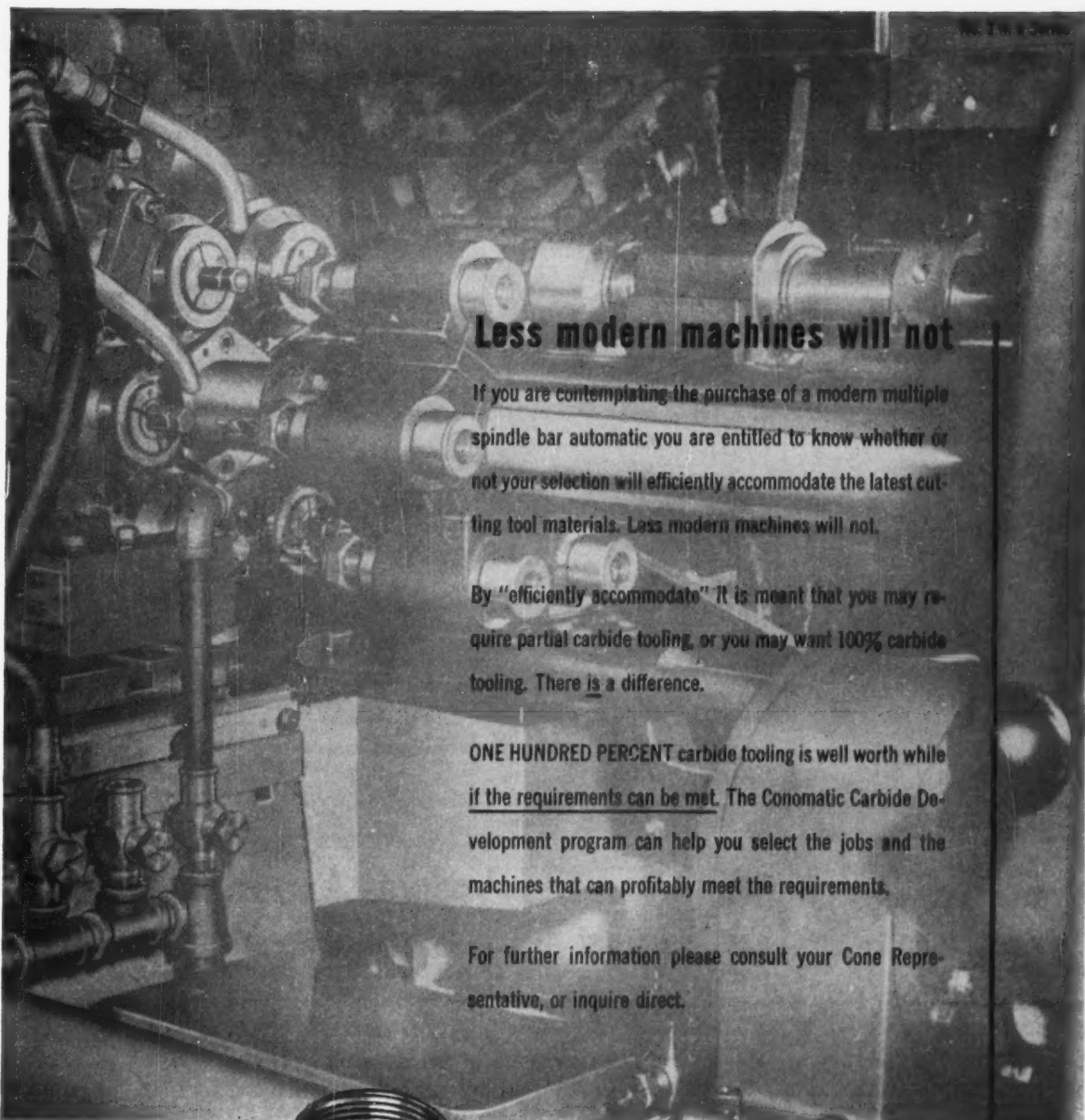
# CHAMBERSBURG

THE HAMMER BUILDERS

Builders of THE IMPACTER



"FORGING IN MID-AIR"



## Less modern machines will not

If you are contemplating the purchase of a modern multiple spindle bar automatic you are entitled to know whether or not your selection will efficiently accommodate the latest cutting tool materials. Less modern machines will not.

By "efficiently accommodate" it is meant that you may require partial carbide tooling, or you may want 100% carbide tooling. There is a difference.

ONE HUNDRED PERCENT carbide tooling is well worth while if the requirements can be met. The Conomatic Carbide Development program can help you select the jobs and the machines that can profitably meet the requirements.

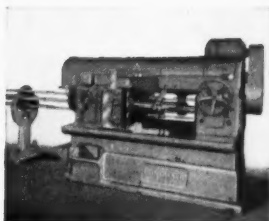
For further information please consult your Cone Representative, or inquire direct.



MATERIAL—1040 STEEL

|                    | HSS | CARBIDE                      |
|--------------------|-----|------------------------------|
| Cycle Time         | *   | 30 secs.                     |
| Work Spindle Speed | *   | 670 R. P. M.<br>at 160 S. F. |
| Tool Wear          | *   | 2000 pcs.<br>per grind       |

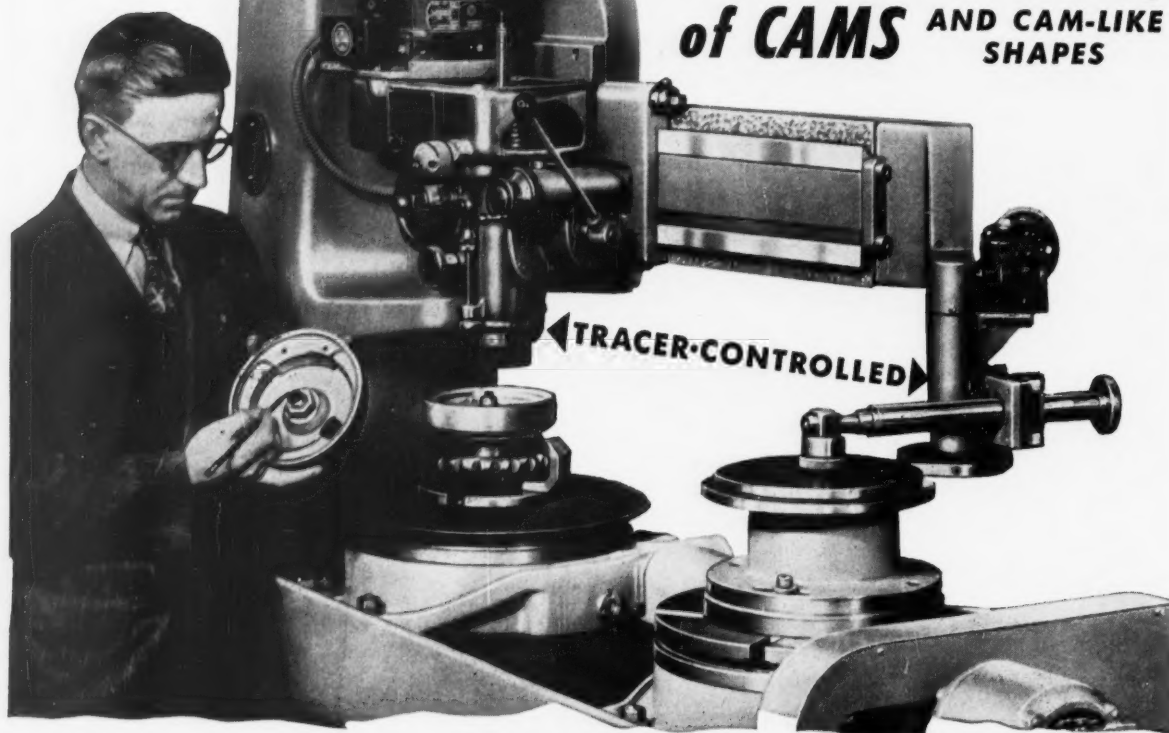
\*Hot rolled material prevents fair comparison



# Conomatic } CONE AUTOMATIC MACHINE COMPANY, INC. WINDSOR, VT., U.S.A.



# **GORTON** *Brings You* **High Production** **Automatic Profiling** **of CAMS** AND CAM-LIKE SHAPES



## **Gorton Contour Mill, CM-12, Produces Extreme Accuracy and High-Surface Finish with Minimum Maintenance**

This machine produces highly accurate, identical pieces — complicated cam shapes, external or internal, or continuous grooves and slots of irregular radii. The Gorton Contour Mill is easy to use and versatile — a simple tracer-controlled, vertical-head milling machine with two rotary power-driven tables. No complicated electronic, hydraulic or pneumatic controls.

### **CAPACITY . . .**

Wide spindle-speed range — 300 rpm to 10,000 rpm — for either high-speed steel or carbide cutters, burrs or grit grinding wheels. The 16-inch master-copy table easily accommodates larger master cams. Several thin cams can be stacked and profiled at once.

### **EXTREME ACCURACY . . .**

Operation depends upon a heavy, single-pivot beam which provides more accuracy than can be built into the tooling. A choice of several reduction ratios adds to accuracy and provides low micro-inch finishes. The reduction ratio principle produces piece parts to closer tolerances than those of the master.

### **CUSTOM-DESIGNED . . .**

The basic machine is standard, but each mill is tooled for specific work. Because all machine elements are individually motor-driven, the machine can be adapted to a wide range of applications. Write for complete details and your copy of Special Bulletin 2380-C-1309.

## **GEORGE GORTON MACHINE CO.**

**1309 RACINE STREET • RACINE, WISCONSIN, U. S. A.**

# GEARS

with Accurate Tooth Contour

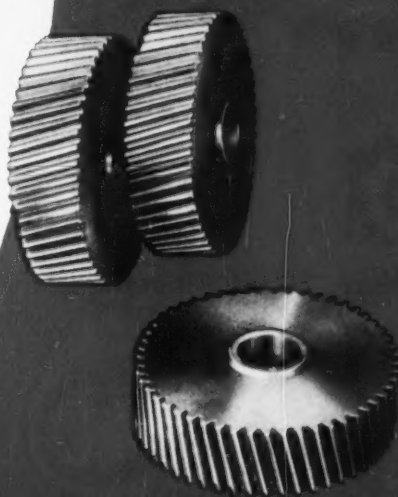
Proper tooth contour is essential to satisfactory gear performance. In manufacturing Philadelphia Gears we use the latest and most accurate gear cutting machinery, modern methods of metal hardening to prevent distortion. Frequent and careful inspections assure accurate tooth form in full adherence to your specifications.

For long service life with fewer maintenance problems . . . order Philadelphia Gears.

Philadelphia Gears can be supplied in all types, sizes and materials, for every industrial requirement.

Our engineering staff can help you solve your gear problems with the experience of 60 years of gear making.

You'll find our Gear Catalog a help to gear buyers and users. It's full of gear information. Write for it on your business letterhead.



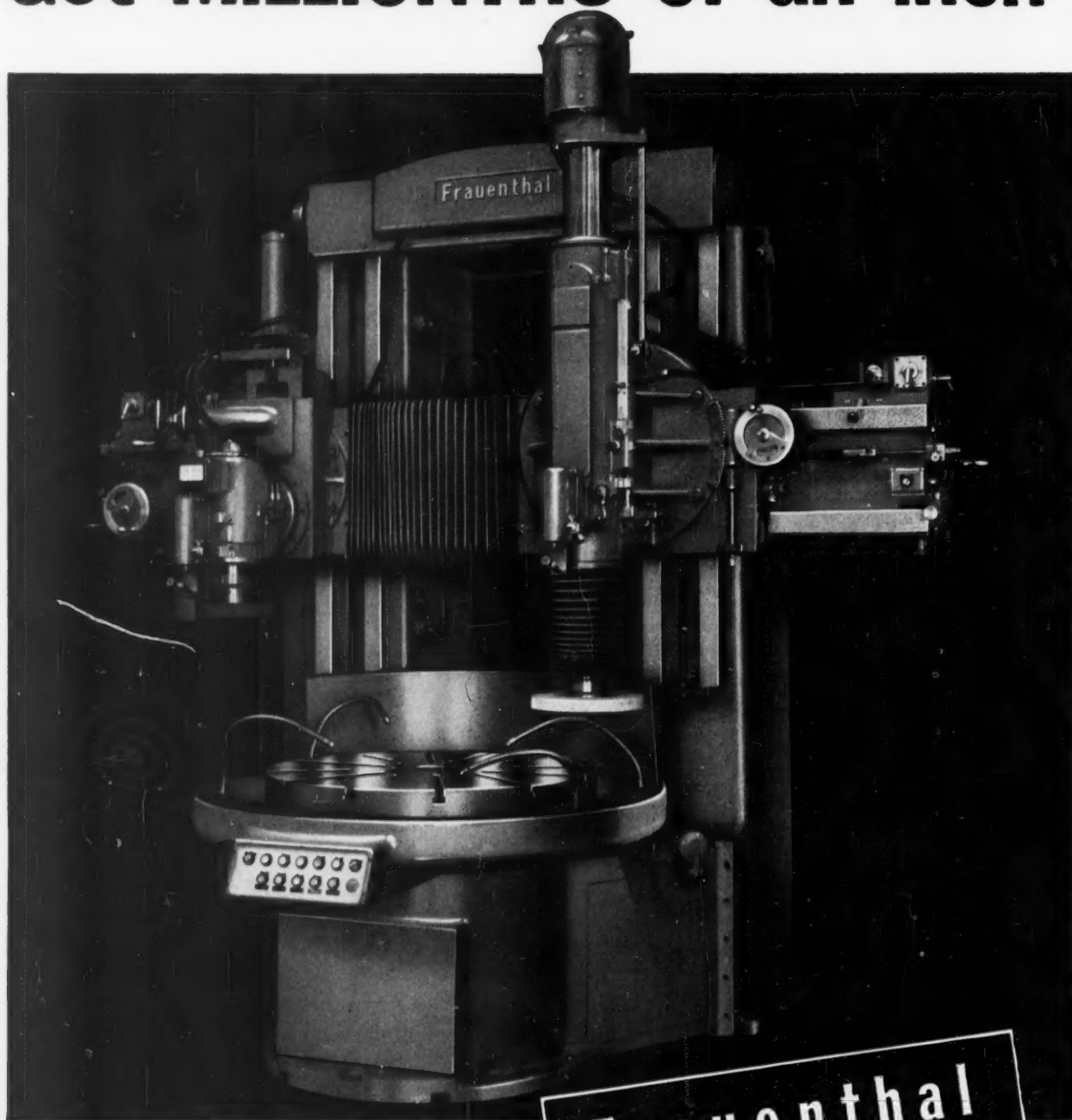
## Philadelphia Gear Works, INC.



ERIE AVE. AND G ST., PHILADELPHIA 34, PA.  
NEW YORK • PITTSBURGH • CHICAGO • HOUSTON • LYNCHBURG, VA.

Industrial Gears and Speed Reducers  
LimiTorque Valve Controls

# Get MILLIONTHS of an inch



This 1800 Series Frauenthal Grinder was specially engineered with direct-connected spindle and quill-type spindle (25" stroke) for fast precision-grinding of vital aircraft engine parts to millionths-of-an-inch tolerance.

**Frauenthal**  
Grinders

MULTIPLE-HEAD /  
SUPER-PRECISION  
CYLINDRICAL  
PRECISION-GRIND INSIDE, OUTSIDE AND FACES  
SIMULTANEOUSLY TO MILLIONTHS OF AN INCH!

# PRECISION at low cost with Frauenthal Grinders

## Grind to "AIRCRAFT Precision"... faster!

On all of your own toolroom and production grinding, you can get the super-precision demanded in grinding the most accurate aircraft parts by using Frauenthal "millionths-of-an-inch" grinders. Through more than a decade these grinders have been performance-proved on the toughest precision jobs... grinding parts for aircraft, jet and automotive engines; tanks; gunmounts; radar units; Diesel connecting rods; plug valves; large diameter high precision bearings and other industrial and military parts and assemblies, consistently, to *fractions of ten-thousandths*, best expressed in *millionths* of an inch!

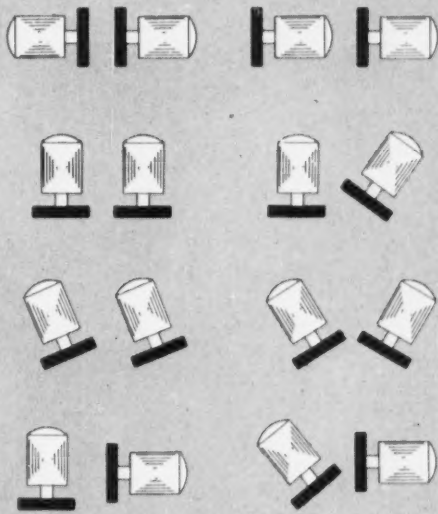
## Save time and money by SIMULTANEOUS grinding of inside and outside diameters or faces

With Frauenthal Multiple-Head Cylindrical Grinders you save important time and lots of money because *simultaneous* grinding of *related surfaces* assures utmost precision and unfailing interchangeability of parts. Adaptations for super-precision boring or turning also can be engineered into these grinders for specific jobs.

## What's YOUR Grinding problem?

Tell us, in confidence, what you want to grind. Frauenthal Grinders permit many combinations of grinding-spindle positions for a wide variety of simultaneous grindings of outside and inside diameters or faces. Large diameters can be ground to the extremely close tolerance of .000200" (200-millionths of an inch) or better, with assurance of uniform precision in concentricity, parallelism and roundness. Valuable details on request. We'll be glad to work with you on difficult grinding, boring, turning problems.

Many combinations of spindle positions for simultaneous grinding on all sizes of Frauenthal grinders



| TEN STANDARD SIZES conforming to essential J.I.C. specifications |             |               |
|--|-------------|---------------|
| SERIES   | TABLE SIZES | MAXIMUM SWING |
| 1600   | 30"         | 60"           |
|  | 36"         | 60"           |
|  | 42"         | 60"           |
|  | 48"         | 60"           |
| 2000   | 60"         | 72"           |
|  | 72"         | 88"           |
| 2200   | 110"        | 120"          |
|  | 120"        | 130"          |
|  | 130"        | 140"          |
|  | 140"        | 150"          |

WRITE FOR BULLETIN

# Frauenthal Division

THE KAYDON ENGINEERING CORP. • MUSKEGON, MICHIGAN

For more information on products advertised, use Inquiry Card, page 239

MACHINERY, September, 1953—57



# Cut your **TOOL GRINDING** costs...



# **CARBO**

REGISTERED

# with wheels engineered for the job

Choose the *right* grinding wheel for *every* tool grinding job—from the complete line by CARBORUNDUM.<sup>®</sup> That's the first step toward longer cutting life for your tools... lower maintenance costs in the tool room.

Every tool room grinding wheel by CARBORUNDUM is engineered to do a specific job at the lowest possible cost. You may want faster production of cutting angles, rakes and clearances; or perhaps better finish is more important; or cooler cutting. What-

ever features, or combinations of features, you may require—there's a tool room grinding wheel by CARBORUNDUM that's *right* for you... a wheel with the right grain type and size, the right grade and structure, the right bond. Whether you're grinding high speed steel, alloy, or cemented carbide cutting tools, not only these wheels but coated abrasive belts by CARBORUNDUM will help you cut costs.



**Your CARBORUNDUM Distributor** or salesman is ready to help you make the right selection of wheels for every grinding operation in your tool room. His wide experience in evaluating all the variables—and coming up with the right answers—makes him the most valuable consultant your tool room can have. Why not call him today? He's listed in the yellow pages under "Abrasives" or "Grinding Wheels."

# FREE

two helpful  
booklets...

tell you many ways to  
cut costs and improve  
grinding techniques in  
your tool room.



THE CARBORUNDUM COMPANY, Dept. M 81-316  
Niagara Falls, New York

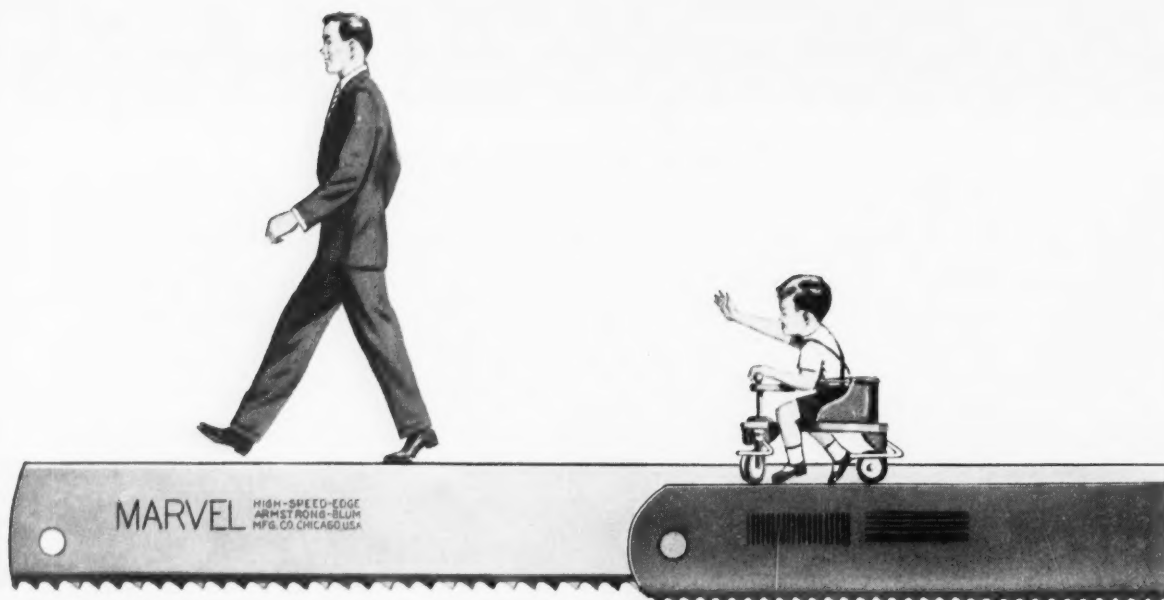
Please send me ☐ "Maintenance of Alloy and High Speed Cutting Tools"  
☐ "Grinding Cmented Carbides"

NAME \_\_\_\_\_ TITLE \_\_\_\_\_  
COMPANY \_\_\_\_\_  
STREET AND NUMBER \_\_\_\_\_  
CITY \_\_\_\_\_ ZONE \_\_\_\_\_ STATE \_\_\_\_\_

# RUNDUM

TRADE MARK

...the **ONLY** source for **EVERY** abrasive product you need



...but

## Experience Cannot be Copied

More than a quarter-century ago MARVEL invented and basically patented the MARVEL High-Speed-Edge Hack Saw Blade—the UNBREAKABLE blade that increased hack sawing efficiency many-fold.

Every MARVEL Hack Saw Blade ever sold has been of that basic welded high-speed-edge construction, with constant improvements from year to year, as EXPERIENCE augmented the "know-how" . . .

MARVEL is not "tied" to any single source of steel supply, and has always used the best high speed steels that became available from time to time as metallurgy progressed. When-as-and-if finer steels are developed—and are proven commercially practical for welded-edge hack saw blades—MARVEL will use them, regardless of cost or source . . .

There is only one genuine MARVEL High-Speed-Edge! All other "composite" or "welded-edge" hack saw blades are merely flattering attempts to imitate—without the "know-how" of MARVEL EXPERIENCE . . .

Insist upon *genuine* MARVEL High-Speed-Edge when buying hack saw blades—and be SAFE, for you can depend upon MARVEL. They have been "tested", "pre-tested", and "re-tested" by thousands of users for more than a quarter-century!



ARMSTRONG-BLUM MFG. CO. • 5700 Bloomingdale Ave. • Chicago 39, U. S. A.



**GTD**  
**GREENFIELD**

## **"YES...WE'VE GOT THOSE TAPS IN STOCK"**

That's your INDUSTRIAL DISTRIBUTOR talking. Many a time, no doubt, you've heaved a sigh of relief when you've heard the welcome words, "Sure we've got 'em", or when you need service, "We'll send Jack right over".

And your GTD-GREENFIELD Distribu-

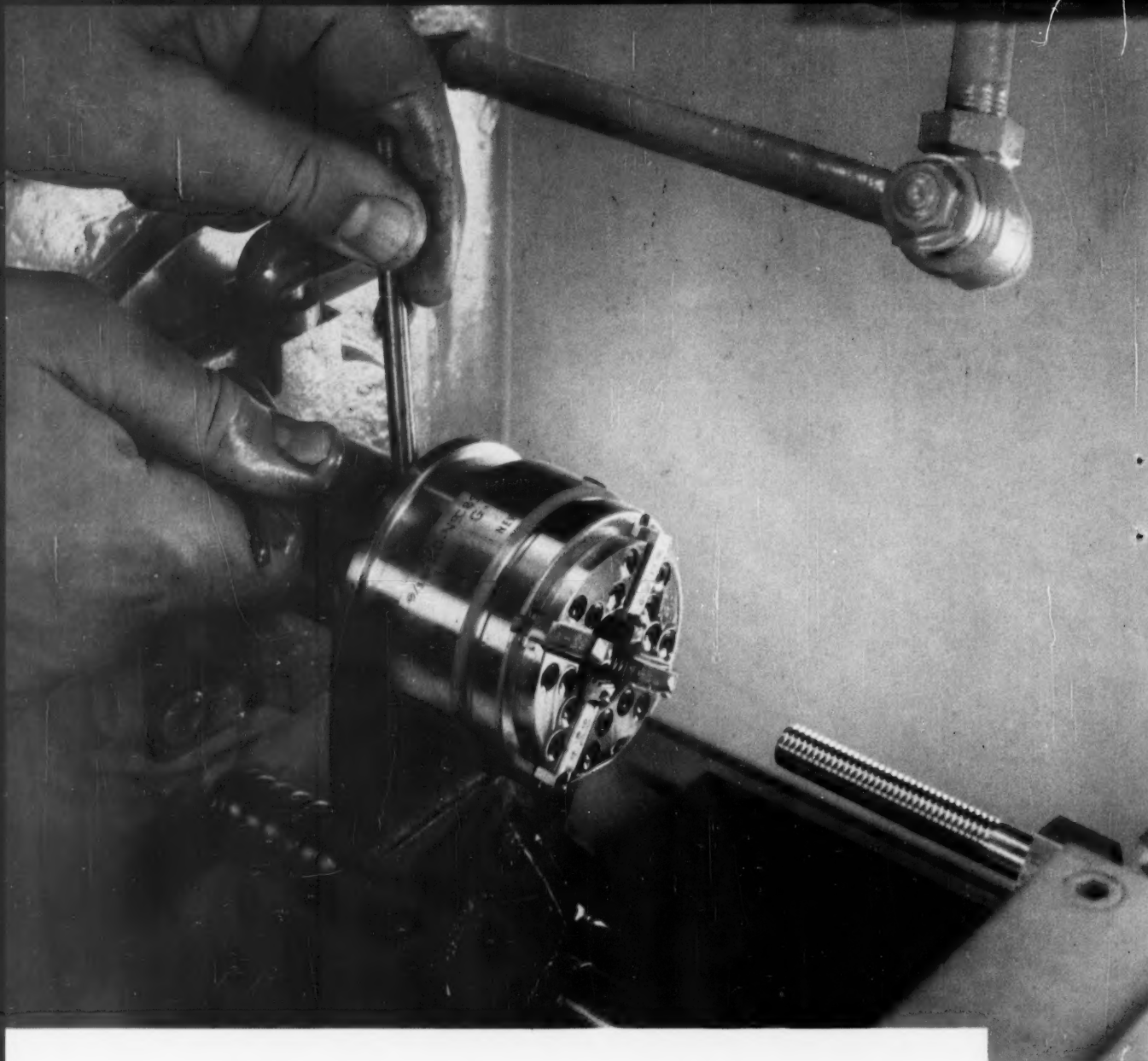
tor also has direct friendly contact at the factory with men he knows well, regarding non-stocked items or special tools.

Yes, it will pay you to get better acquainted with your GTD-GREENFIELD Distributor. Stop shopping around... stop buying the hard way.

**GREENFIELD TAP AND DIE CORPORATION**

GREENFIELD, MASS.





## **QUICK ADJUSTMENT..ON THE MACHINE!**

For high-speed service on live spindle machines, the KD Rotary Self-Opening GEOMETRIC Die Head is compact, accurate, well balanced . . . made for long, trouble-free life. Chasers are adjusted merely by loosening a Binding Screw and turning Adjusting Ring for desired size. No need to take the head off the machine, even to change the chasers.

Available in seven sizes for #0 to 2 $\frac{1}{2}$ " diameter threads. Hollow shanks allow threading to any length. A positive-opening flange trip provides for repeat threading to identical lengths.

*Write for full details. Specify Bulletin KD*

*Greenfield Tap and Die Corporation*  
**GEOMETRIC TOOL COMPANY DIVISION**  
NEW HAVEN 15, CONNECTICUT

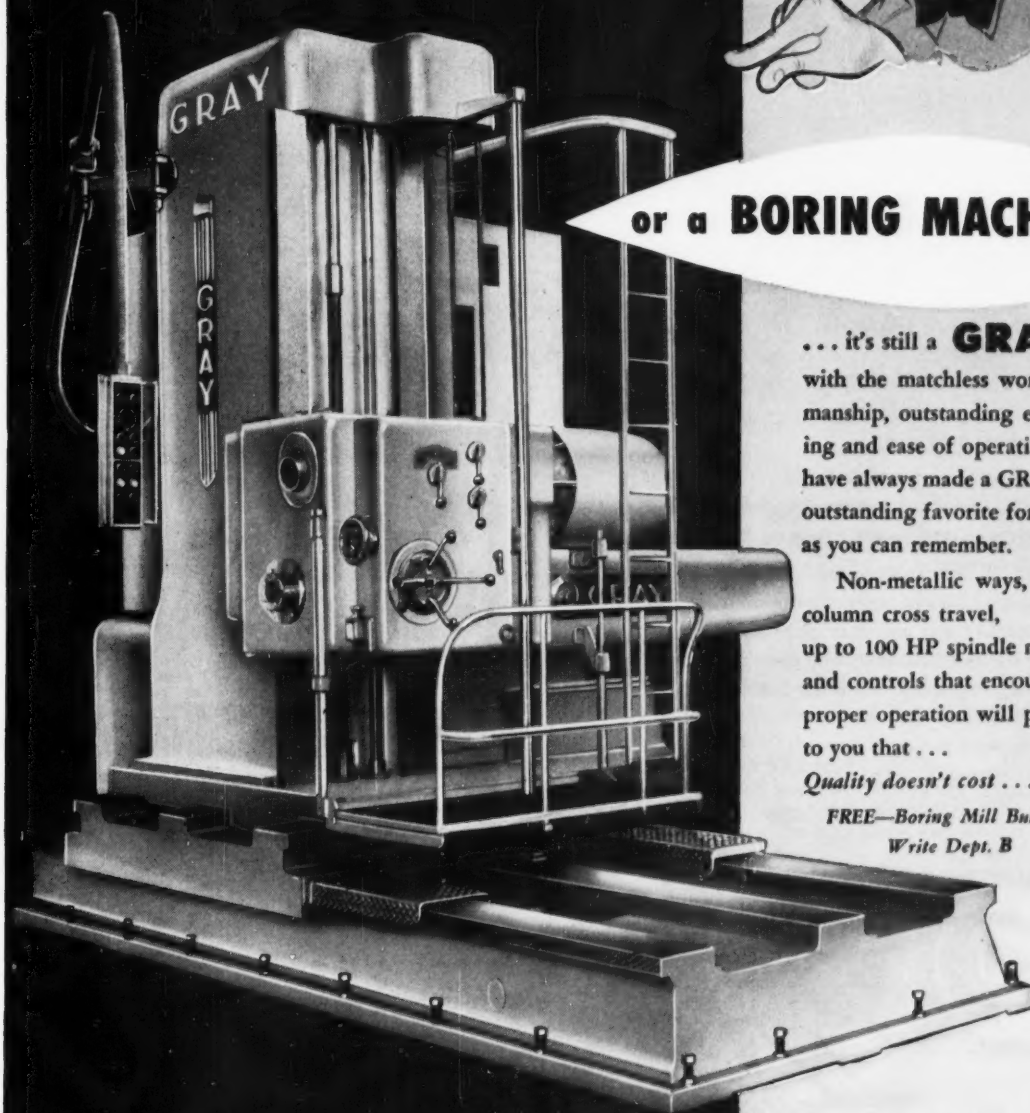


whether it's a

... **PLANER**



or a **BORING MACHINE**



... it's still a **GRAY**  
with the matchless work-  
manship, outstanding engineer-  
ing and ease of operation that  
have always made a GRAY the  
outstanding favorite for as long  
as you can remember.

Non-metallic ways,  
column cross travel,  
up to 100 HP spindle motor,  
and controls that encourage  
proper operation will prove  
to you that . . .

*Quality doesn't cost . . . it pays.*

FREE—Boring Mill Bulletin.  
Write Dept. B

*The G.A.* **GRAY** *Company*

CINCINNATI 7, OHIO, U. S. A.

SOLD IN CANADA BY UPTON, BRADEN AND JAMES, LTD. • SOLD IN LATIN AMERICA BY MACHINE AFFILIATES

planers • milling planers  
planer type milling machines  
horizontal boring machines

## hendey lathes are better built...

**FOR LONGER, MORE ACCURATE LIFE!**

*And here's how it's done* — Hendey starts with quality design and follows through with quality workmanship. Take the hardened and precision ground bed ways, for instance. Hendey does this differently *and better!* First, the world's most modern induction hardening equipment uniformly hardens the ways. Next, the precision machined legs and chip pan are attached to the bed (and they are never removed thereafter). Ultra precision grinding follows. Exacting checks for accuracy are then followed by electronic testing for hardness — uniform hardness — there are no soft spots in a Hendey bed — and a customer's test sheet proves it!

Add to this, quiet headstocks, the finest of lead screws, simplified, convenient controls and the ruggedness and power essential for modern precision turning.

Hendey lathes maintain the Hendey tradition for quality and accuracy. And there is the *right* machine in the Hendey line to suit your precision turning requirements. Write for details.

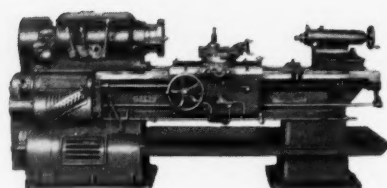


*Featuring uniformly hardened and precision ground bed ways.*

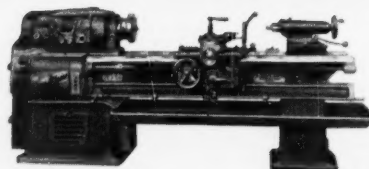


**the Hendey  
machine co., inc.**  
torrington, conn., u.s.a.  
—precision machine tools—

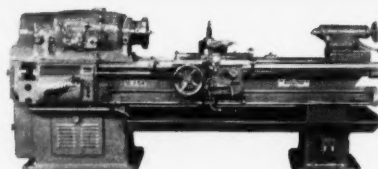
*distributors in principal cities*



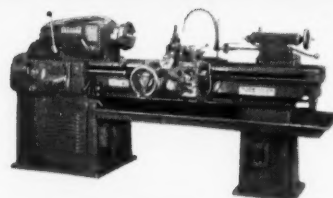
**18" — 20" — 24" 12-speed Geared Head Lathes**



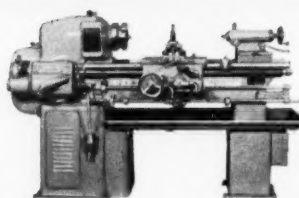
**12" — 14" — 16" 18-speed Geared Head Lathes**



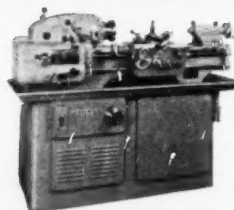
**12" — 14" — 16" 12-speed Geared Head Lathes**



**No. 2 General Purpose Lathe**

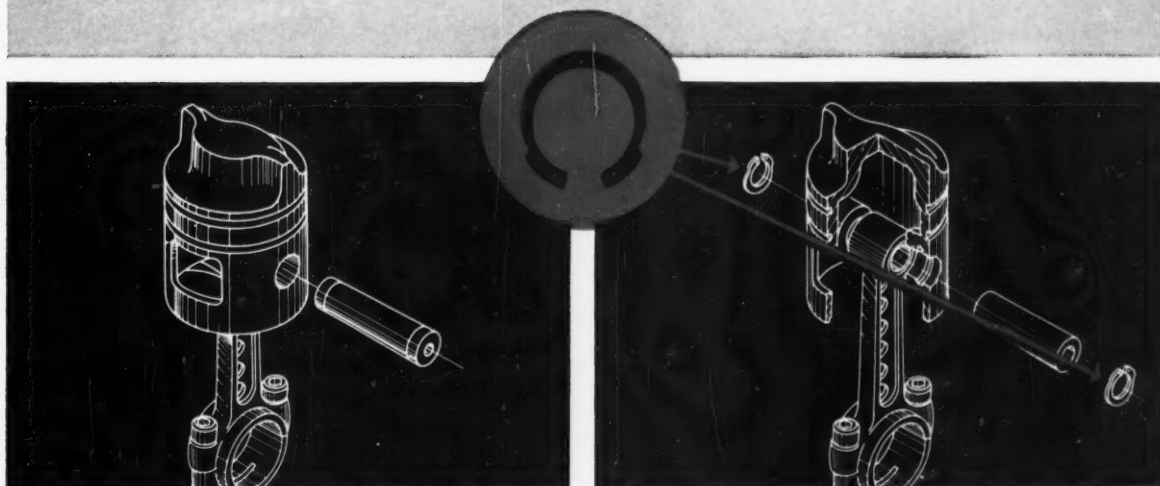


**No. 1 General Purpose Lathe**



**9" x 24" Tool & Gage-Makers' Lathe**

# 2 Waldes Truarc Rings Replace 2 End Plugs ...Eliminate 3 Operations...Save \$.066 Per Unit



**OLD WAY** Two inserted-plug type wrist pin locks hold wrist pin in place. 3 operations involved: costly machining, pressing in place, post-assembly machining. Costly maintenance problem—resulting from end plugs hammering loose.

**TRUARC WAY** Two Truarc Inverted Retaining Rings (Series 5008) hold wrist pin in place. Truarc Rings snap into grooves easily cut in piston, provide positive lock . . . practically eliminate maintenance costs. Quick assembly, disassembly.

Titan Chain Saws, Inc., Seattle, Washington, uses 2 Waldes Truarc Rings to replace old-style inserted-plug type wrist pin locks in their Titan chain saws. Use of Waldes Truarc Retaining Rings eliminates 2 press fit end plugs. Machining of plugs, pressing in place, finish machining—no longer required. Truarc way holds rejections to a minimum. Unit efficiency is greatly increased.

Redesign with Truarc Rings and you, too, will cut costs. Wherever you use machined shoulders, bolts, snap

## USE OF 2 WALDES TRUARC RINGS PERMITTED THESE SAVINGS PER UNIT:

### OLD WAY

Cost of 2 end plugs }  
Cost of pressing in and machining } . \$ .169

### TRUARC WAY

Cost of grooving piston }  
Cost of 2 Truarc Rings } .....103

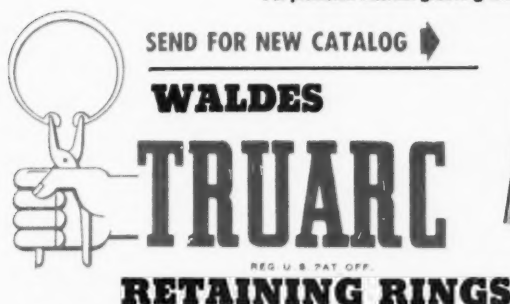
Saving per Unit ..... \$ .066

rings, cotter pins, there's a Waldes Truarc Retaining Ring designed to do a better job of holding parts together.

Waldes Truarc Rings are precision-engineered . . . quick and easy to assemble and disassemble. Always circular to give a never-failing grip. They can be used over and over again.

Find out what Waldes Truarc Retaining Rings can do for you. Send your blueprints to Waldes Truarc engineers for individual attention, without obligation.

For precision internal grooving and undercutting . . . Waldes Truarc Internal Grooving Tool.



**WALDES KOHINOOR, INC., LONG ISLAND CITY 1, NEW YORK**  
WALDES TRUARC RETAINING RINGS AND PLIERS ARE PROTECTED BY ONE OR MORE OF THE FOLLOWING U.S. PATENTS: 2,383,947; 2,383,948; 2,416,852; 2,420,921; 2,428,341; 2,439,785; 2,441,846; 2,455,165; 2,483,380; 2,483,383; 2,487,802; 2,487,803; 2,491,308; 2,509,081 AND OTHER PATENTS PENDING.



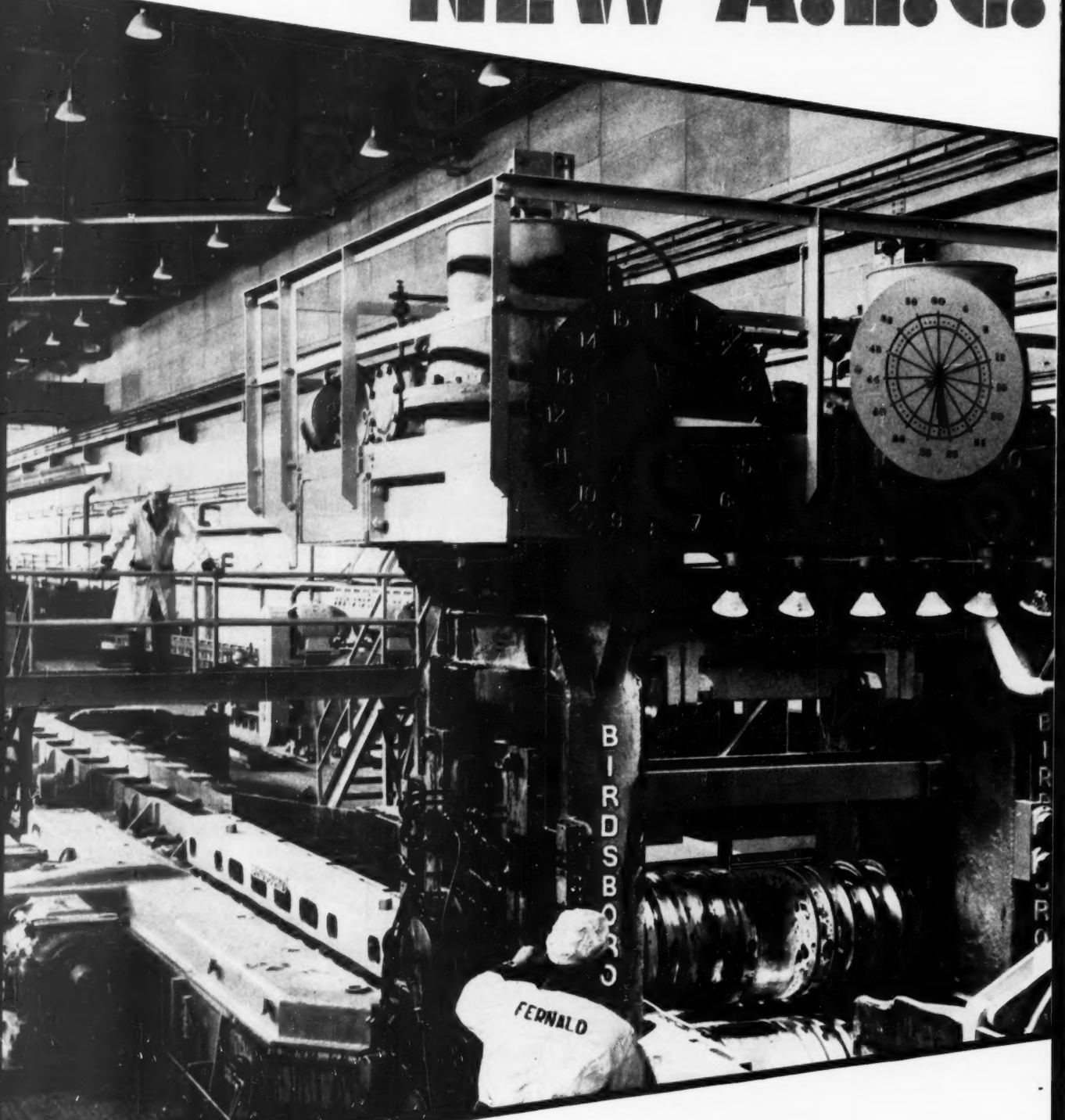
Waldes Kohinoor, Inc., 47-16 Austel Place, L. I. C. 1, N. Y.  
Please send me the new Waldes Truarc Retaining Ring catalog.

(Please print)

Name.....  
Title.....  
Company.....  
Business Address.....  
City..... Zone..... State.....



# NEW A.E.C.



*This primary Birdsboro mill, followed by a continuous Birdsboro finishing mill, is used to roll uranium into bars for further fabrication into slugs used in nuclear reactors.*

**designed and built by**

Bi  
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# URANIUM MILL

**goes into operation at Fernald, Ohio**

**Birdsboro builds first and only mill expressly designed for production rolling of uranium. New unit becomes an important link in U. S. atomic weapon output.**

A. E. C.'s new rolling mill, completely designed and built by BIRDSBORO, now becomes a vital part of the Commission's new uranium production center at Fernald. This center produces uranium for use in A. E. C. fissionable materials plants elsewhere. BIRDSBORO is proud of the prominent role it played in making the new mill possible. It was an exacting job and there was a host of engineering problems to be solved before the mill was completed. Month after month was spent in research and experimentation on the tricky job of rolling uranium ingots into bars. BIRDSBORO started from "scratch", designed and built the mill completely . . . and today it is in steady, high volume production.

UNITED STATES  
ATOMIC ENERGY COMMISSION  
NEW YORK OPERATIONS OFFICE

April 3, 1953

Mr. J. M. McCauley, President  
Birdsboro Steel Foundry & Machine Company  
Birdsboro, Pennsylvania

Dear Mr. McCauley:

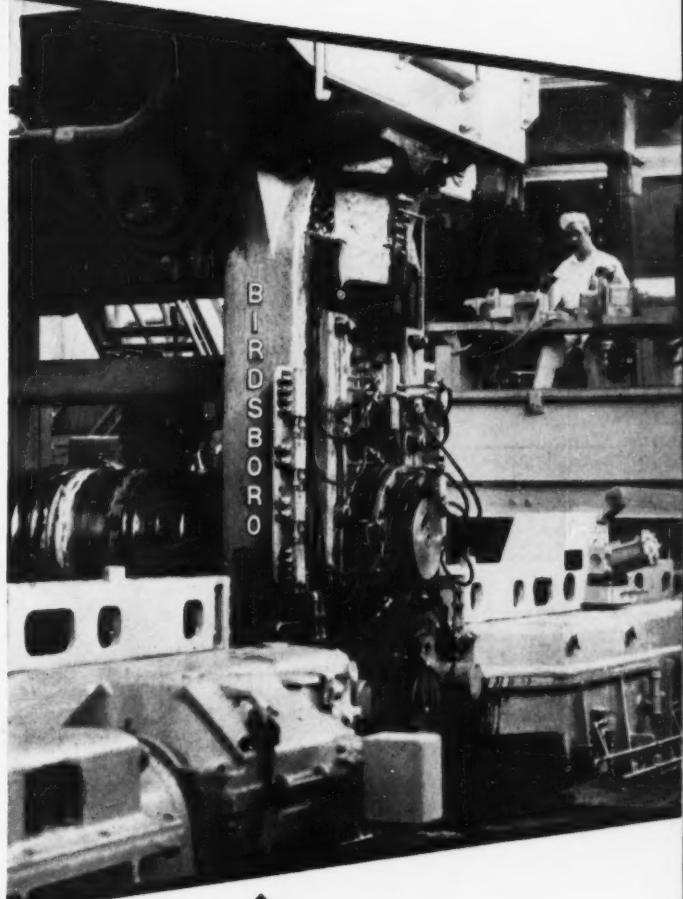
It is with pleasure that I commend Birdsboro Steel Foundry & Machine Company, and in particular the Engineering Department of its Rolling Mill Division, on an outstanding performance in designing and manufacturing a special mill to roll uranium for the United States Atomic Energy Commission. Not only was this an extraordinary achievement in terms of speed, but the costs of the mill have been held well in line with the original estimates which were projected from quite sketchy information. This is indeed a credit to your Company, and bespeaks the high ability of your staff. . .

Again I wish to thank and commend you, and through you the Birdsboro staff, on an excellent job.

Very truly yours,

*H. B. Fry*  
H. B. Fry  
Manager

MsHEF:ab



*Birdsboro brought over 58 years of experience and engineering skill to bear on the new A. E. C. mill . . . the same experience and know-how the Company offers you in your search for better, lower-cost mill rolling operations.*

*" . . . an extraordinary achievement in terms of speed . . . a credit to your Company, and to the high ability of your staff."*

# BIRDSBORO

**BIRDSBORO STEEL FOUNDRY & MACHINE CO., BIRDSBORO, PENNA.**

STEEL MILL  
MACHINERY

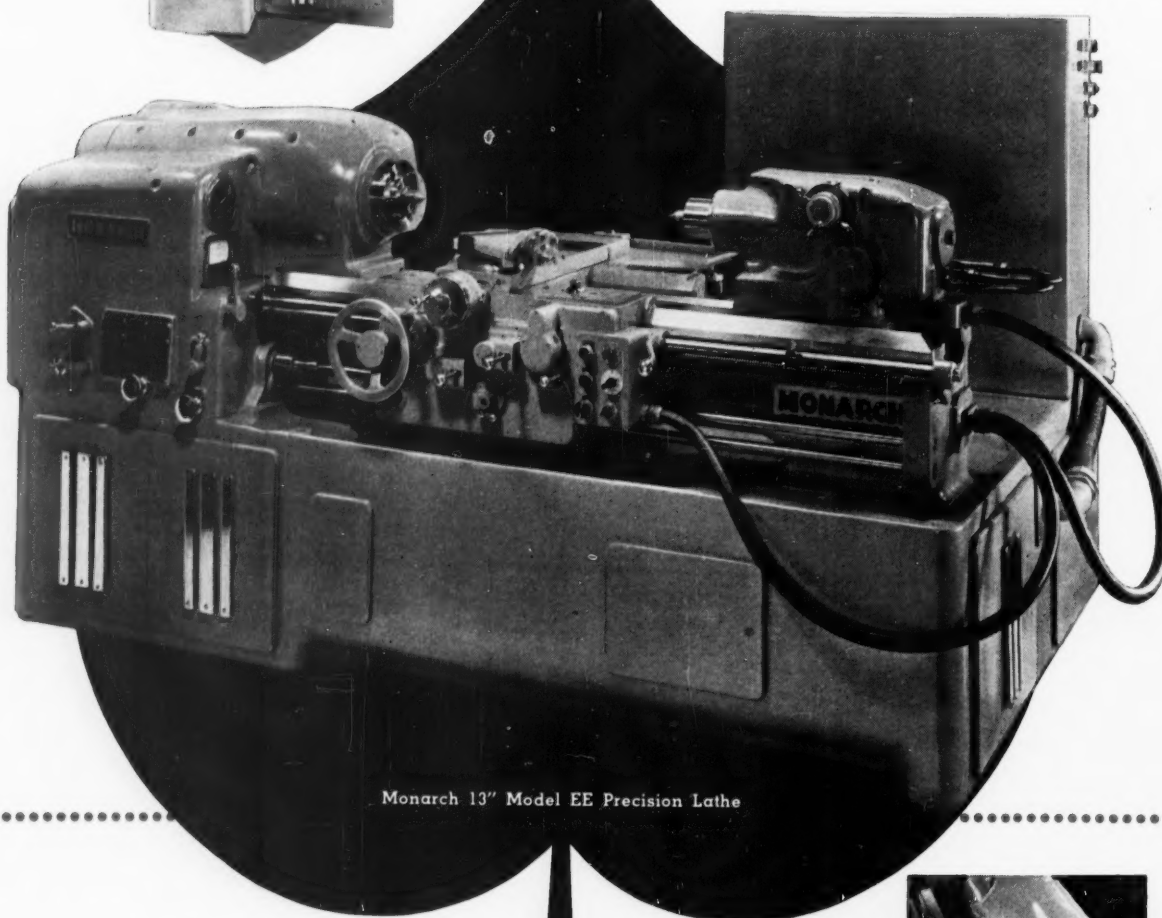
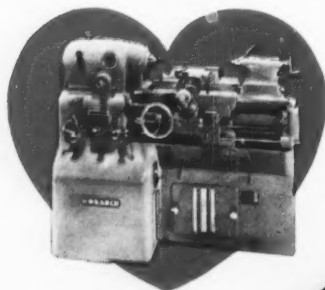
Offices in Birdsboro, Pa.  
and Pittsburgh, Pa.

• **designers and builders of:** Steel Mill Machinery • Crushing Machinery • Hydraulic Presses • Rolls • Special Machinery • Steel Castings

# This One New

You're acquainted with this sweetheart—the 10" Monarch Model EE—one of the most popular lathes ever built. Over 6,000 in use.

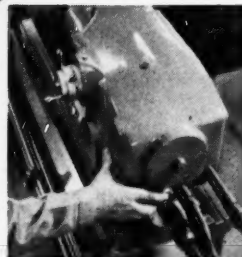
Now—Monarch introduces the EE's big brother—the larger lathe you have been asking for. Not simply a larger EE, this new lathe embodies features never before perfected and combined in any lathe.



Monarch 13" Model EE Precision Lathe

FOR A GOOD TURN FASTER . . .

TURN TO MONARCH



The mere touch of this button unclamps the 385 pound tailstock—a slight push or pull moves it along the bed while release of the button reclamps it. Its  $3\frac{3}{4}$ " diameter spindle is indicative of the strength built into the entire machine.

# Ace Takes EVERY Trick!

Toolmaker's Lathe! Manufacturing Lathe! The New  
MONARCH 13" MODEL EE PRECISION LATHE is a Standout in Both Roles

Here's the first and only truly dual purpose lathe ever made!

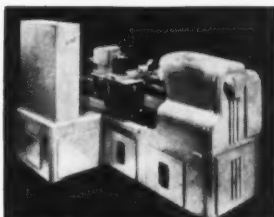
In the toolroom, it provides toolmaker's precision—plus a new high standard in amount of work output. On manufacturing operations, it slashes turning time unbelievably, with no sacrifice of its basic accuracy. For more profitable performance in *each* use, and unequalled performance in *both*, the Monarch 13" Model EE is your answer for practically every type of turning.

Everything about this machine represents fresh engineering thinking. Consider these features.

**1. Built-in constant surface cutting speed.** Becomes operative at the flick of a switch. With it, the operator is *always* using the most efficient cutting speed. Finish and accuracy are improved; turning time on some facing operations can be reduced up to 50%.

**2. All-hydraulic tailstock.** Nothing like it on any other lathe. Hydraulic positioning and clamping permits almost effortless repositioning of this 385 lb. unit in a matter of a few seconds. Hydraulic feed and traverse to the spindle. Drilling and reaming operations performed with a quickness and ease never thought possible heretofore.

**3. Infinitely variable speeds up to 2000 R.P.M.** In four overlapping ranges and provided by a 15 H.P. variable speed motor. The number of speeds is



limitless—the one which is ideal for the job at hand can always be secured. High speed range direct to spindle through multiple "V" belts for the ultimate in high finish performance.

**4. Electrical speed change.** It's practically instantaneous. The turn of a knob gives every speed within a given range; change-over from one speed range to another is automatic immediately upon resetting of selector knob. No calculating of lever settings by reference to an index plate. Nothing could be as simple, as quick, as positive.

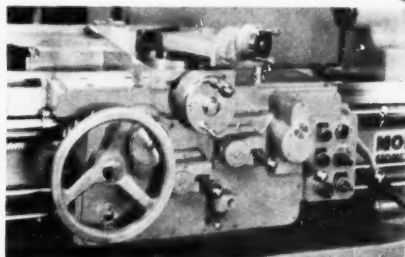
**5. Four-way rapid tool traverse.** Cross traverse in and out and longitudinal traverse right or left provided by individual motor drive. Tool repositioning couldn't be made easier or faster.

**6. Flexibility unlimited.** It's difficult to find a lathe job which the 13" Model EE cannot handle. There are 66 thread and feed changes. Regular equipment includes a ball bearing taper attachment, direct length reading dial, thread chasing stop, apron controlled leadscrew reverse with automatic stop in both directions, steady rest and follow rest.

Surely, you'll want to know more about this lathe whose features place it in a class all its own. The complete story is in booklet No. 502. Just fill in the coupon and we'll send it gladly.



TURNING MACHINES



Complete control of the machine is concentrated at the apron which is always convenient to the operator. Besides the usual controls found on conventional lathe aprons, this one is provided with complete control of the four-way rapid tool traverse, the built-in constant surface cutting speed and full electrical control of the speed change and the work drive motor. Add to this also the apron controlled lead-screw reverse.

THE MONARCH MACHINE TOOL COMPANY, SIDNEY, OHIO

Gentlemen:

Please send me without obligation your Booklet No. 502 giving full information and description of the Monarch 13" Model EE Precision Lathe.

NAME \_\_\_\_\_

COMPANY \_\_\_\_\_

TITLE \_\_\_\_\_

ADDRESS \_\_\_\_\_

CITY \_\_\_\_\_

ZONE \_\_\_\_\_

STATE \_\_\_\_\_





The New  
Size 00  
with Centering-  
Size Discs

Range  $\frac{1}{4}$ " to  $\frac{3}{8}$ "

Pat. Appl. For



## Dial Bore Gages

8 Sizes cover range  
 $\frac{1}{4}$ " to  $12\frac{1}{8}$ "  
(with extensions to 16")  
Standard, Vertical and  
Pistol-Grip Types



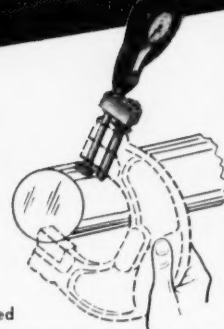
## Dial Indicators

Consistently accurate. Shockproof. A wide range of sizes and graduations, including Long Range, 90 Degree, Long Stem and Decimatic models.

# Your Choice of Many Gages

## Dializers

An economical, effective means for converting AGD Adjustable Limit Snap Gages (Models A, B or C) to Dial Snap Gages. Easily installed or transferred from one frame to another.



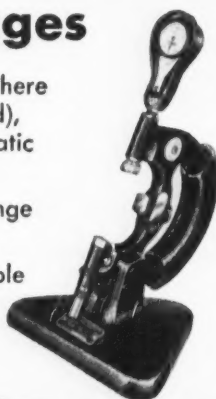
Patented

## Dial Snap Gages

Comparator (shown here with optional stand), Encased and Decimatic Types

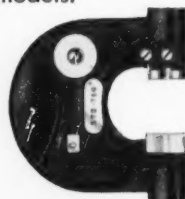
Stock sizes cover range 0" to 8"

Larger sizes available



## Adjustable Limit Snap Gages

AGD designs in both regular and midget models.



Also . . .  
Master Setting Gages  
Comparators  
Dial Depth Gages  
Dial Pin Gages  
Adjustable Limit  
Length Gages  
and Others . . .  
Write for New Catalog C

**STANDARD GAGE CO., INC., Poughkeepsie, N.Y.**



MANUFACTURERS OF MACHINE TOOLS



Chance Vought Twin-Jet Cutlass

United Aircraft Corp. Photo

**The  
Invisible  
Background  
of  
Industrial  
Progress**

Faster than sound — United Aircraft's Chance Vought F7U-3 Twin-Jet "Cutlass" fighter plane is designed to out-fly and out-fight any other carrier-based fighter in the world. Its reputed performance is a credit to the ingenuity of its designers and manufacturers of its jet propulsion equipment.

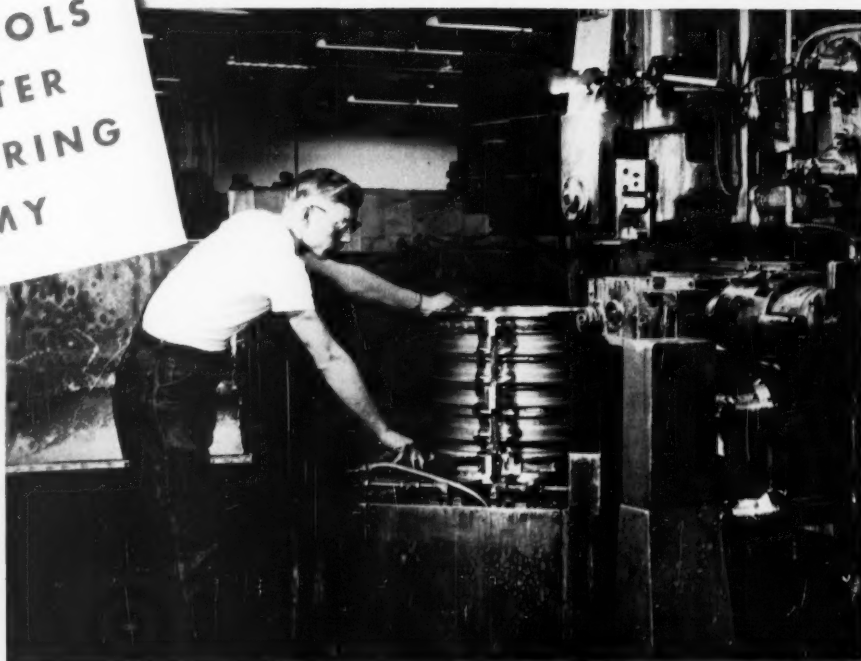
★ The Bullard Company, builders of *Modern Machine Tools*, are proud to have contributed to "The Invisible Background of Industrial Progress" resulting in the success of this fighter — a part of America's first line of defense.

Whether you have small job lots or mass production, we can show you how Bullard Machine Tools can add to your production speed and economy.

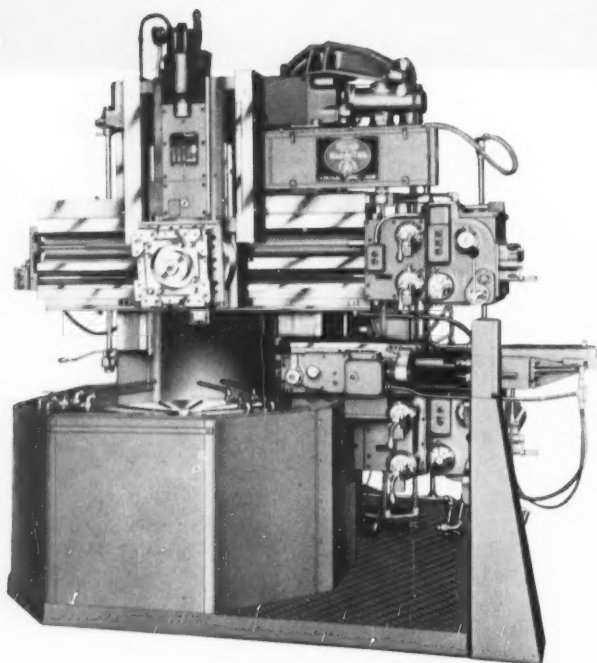
★ For greater manufacturing economy REFER to next page.

**THE BULLARD COMPANY**  
BRIDGEPORT 2, CONNECTICUT

**BULLARD  
MACHINE TOOLS  
FOR GREATER  
MANUFACTURING  
ECONOMY**



The production of jet engine compressor cases on the Bullard Man-Au-Trol Vertical Turret Lathe is one of the many applications possible for this versatile machine tool.



The machine is ruggedly constructed with "built-in" rigidity to insure accurate machining time after time. It may be operated manually by the operator for small runs or automatically by the Man-Au-Trol for mass production. Whatever your need this machine is flexible in its characteristics to fulfill your exacting requirements.

Let Bullard engineers submit a survey on your specific requirements.



*Time saved is money earned. Write now for information on Bullard Man-Au-Trol Vertical Turret Lathe.*

**THE BULLARD COMPANY** BRIDGEPORT 2, CONNECTICUT

# How Allis-Chalmers Reduces Their Cost Savings Opportunities to Careful Analysis

ALLIS-CHALMERS MANUFACTURING COMPANY  
FORM NO. 128-1-1  
PRINTED 12-52

4-25-53

## CAPITAL EQUIPMENT REPLACEMENT ANALYSIS

WORKS: West Allis-General Machinery

1 Subject of Analysis: Purchase and install a new **48" x 48" x 18" Planer** which will replace two (2) Planers M.T. #1266 and M.T. #2587.

2 Anticipated Rate of Production: Proposed equipment will produce all the work processed on existing equipment in 60% of present total time.

3 PROPOSED EQUIPMENT  
Description: **48" x 48" x 18" Double Housing Heavy Duty Planer**

4 Est. Primary Service Life: **20** Years  
Est. Terminal Salvage Value = (X) = **\$7,800.00**  
Est. Cost Installed = (Y) = **\$78,000.00**  
Terminal Salvage Factor = **10** %

5 EXISTING EQUIPMENT  
Purch. Date: **1906** Tool No. **1266 & 2587**  
Description: **M.T. #1266 - 48" x 48" x 10" Planer**  
**M.T. #2587 - 42" x 42" x 8" Planer**  
Years of life to Date: **47 Yrs. each** Installed Cost **\$6,332.11**  
Location: **5 Shop** Dept. No. **1061**  
Intended Disposal: **Sell** Resale Salvage or Conversion Value **\$2500.00**

| FACTOR  | PROPOSED EQUIPMENT   | EXISTING EQUIPMENT  |
|---|----------------------|---|
| 10 Direct Labor (For Anticipated Production):   | \$ 9,885.00          | \$ 16,345.00  |
| 11 Indirect Labor (For Anticipated Production):   | -                    | -   |
| 12 Defective Material Labor & Works Expense:  | -                    | 204.00  |
| 13 Downtime:  | 1,024.00             | 779.00  |
| 14 Power Consumption:   | -                    | -   |
| 15 Tooling:   | 640.00               | 480.00  |
| 16 Supplies:  | 1,534.56             | 34.52   |
| 17 Floor Space (if usable):   | -                    | 1,500.00  |
| 18 Property Taxes & Insurance:  | -                    | -   |
| 19 Normal Maintenance:  | -                    | -   |
| 20 Special Repairs:   | -                    | -   |
| 21 Sub-Contract Costs:  | -                    | -   |
| 22 Other Items (explain on reverse side):   | -                    | -   |
| Totals:   | B = <b>13,063.56</b> | A = <b>19,342.52</b><br>B = <b>13,063.56</b><br>C = <b>6,258.95</b> |
| 23  |                      | D = <b>4,320.00</b>   |
| 24  |                      | E = <b>150.00</b>   |
| 25  |                      | F = <b>500.00</b>   |
| 26 Next Yrs. Variance in Operating Cost (A Minus B):  |                      | G = <b>11,288.95</b>  |
| 27 (Next Years Capital Cost of Retaining Existing Equipment)  |                      | H = <b>9,360.00</b>   |
| 28 Restorative Repairs \$ 27,000  |                      |   |
| 29 Years Effective <b>10</b>  |                      |   |
| 30 Resale Salvage or Conversion Value of Existing Equipment \$ 2500.00  |                      |   |
| 31 Salvage Value Loss, Next Year  |                      |   |
| 32 Total Next Yrs. Cost for Existing Equipment (C + D + E + F)  |                      |   |
| 33 Total Next Yrs. Cost for Proposed Equipment, Chart 6 % + Int. 6% Total <b>12</b> % x <b>\$78,000.00</b> (taking into account Depreciation, Loss of Efficiency and 6% return on Investment) |                      |   |
| First Years Gain (+) or Loss (-) thru replacing existing equipment (G-H) (taking into account Depreciation, Loss of Efficiency and 6% return on Investment)                                   |                      |   |
| Calculated by:  |                      |   |
| Date:   |                      |   |
| Approved by:  |                      |   |

\* Note: Items indicated show difference in costs.

Date: 4-29-53

## Statement by Allis-Chalmers

"This analysis is one of the guides we use in determining the sequence of machine tool replacement . . . it indicates which machine tool purchase will produce the best return on our invested dollar."

**J. D. Greensward**  
Vice President  
Director of Manufacturing  
General Machinery Division  
Allis-Chalmers Manufacturing Company

\* **GAIN** from replacement by the Allis-Chalmers formula is . . .

... after required interest or return on the new investment

... after full allowance (by the formula) for future obsolescence of the new equipment

**Keep Gathering Metal-Working Production Ideas...Be Well Informed When The Time For Replacement Arrives . . . . .**

**ROCKFORD INSERT GROUP**

September, 1953



\* *Check List for*

**PRACTICAL  
LATHE  
TURNING**

*either tool room or high production*

\* BIG ACCURATE LEAD SCREW

INDEPENDENT FEED SHAFT

BIG PRECISION TIMKEN BEARING SPINDLE

HEAVY TAIL STOCK, ANTI-FRICTION THRUST BEARINGS

PRECISION HOBBED AND SHAVED HEADSTOCK GEARS

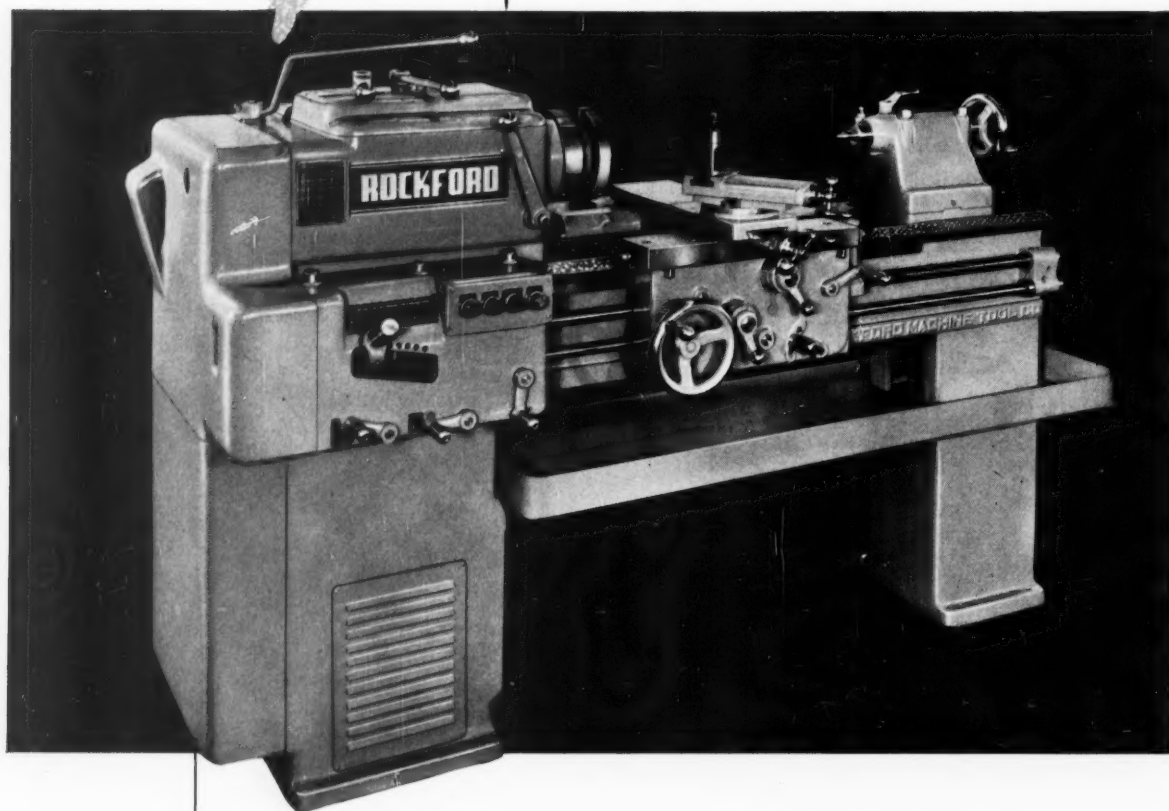
TOOL ROOM ACCURACY, ZERO PRECISION BEARINGS,

PRODUCTION POWER, 5 H.P. DRIVE MOTOR

ALL GEARED HEAD, QUAD-V-BELT DRIVE

HEAVY CUTS, 16" OR 18" SWING, 30" CENTER DISTANCE

6' BED, DOUBLE-WALL APRON, 3100 LBS. TOTAL WEIGHT



Rockford Lathes offer you all of these production features, with modern design, ample dimensions and high quality materials.

Ask a Rockford Machine Tool Co. Representative to give you full details on the practical production advantages of these heavy service, medium sized, economy priced machines.

**MEDIUM-SIZED  
ECONOMY-PRICED**

531

**ROCKFORD ECONOMY LATHES—16" and 18"**

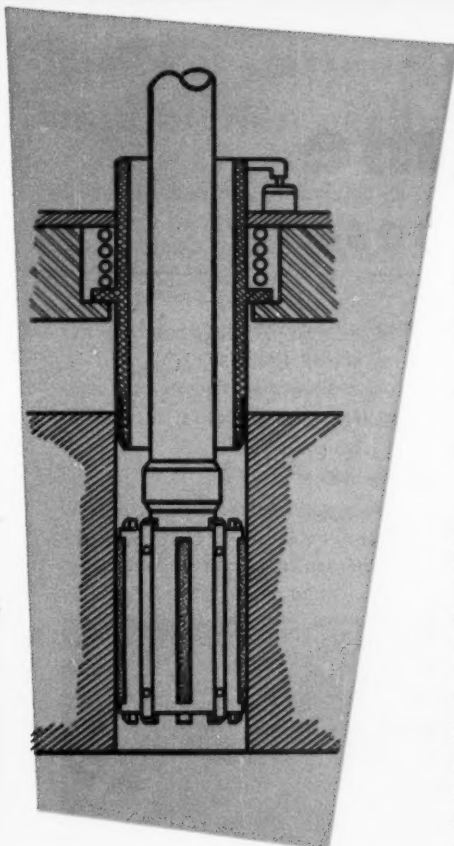
**ROCKFORD MACHINE TOOL CO.**

2300 KISHWAUKEE STREET • ROCKFORD, ILLINOIS

**MADE IN  
ROCKFORD...TESTED ENGINEERING AND CRAFTSMANSHIP  
ILLINOIS, U.S.A.**

*Machinery, September, 1953*





## NEW **BARNESDRIL** HONING DEVELOPMENT

*Plugmatic Bore-to-Bore Sizing  
Gauges Honed Bore Directly.  
Provides New Standard for  
Production Accuracy.*

**BARNESDRIL** Honing Engineers offer a new development in Honing — Plugmatic Bore-To-Bore Sizing, the most accurate and positive sizing method yet introduced. The entire sizing operation is now simplified and is not affected by eccentric or uneven stone wear. The Honed bore is positively gauged and directly controls the termination of the honing cycle as the predetermined size is reached.

Simple in operation and design, a master gauge is positioned in a floating holder with a self-leading nose. When final size is reached, the gauge drops into the bore and by electric controls terminates the honing cycle.

**BARNESDRIL** Plugmatic Sizing is not affected by the angle of operation and is equally effective for vertical, angular or horizontal applications. It provides one type of sizing for regular, counter-bored or blind-end bores.

Longer tool life, faster stock removal and positive automatic bore sizing are obtained with these new **BARNESDRIL** Honing Tools. Get in touch with your **BARNESDRIL** representative for assistance on your finishing operations or write directly to **BARNESDRIL** engineering department.



Get This New Bulletin on Complete Honing Service.  
Copy Mailed Upon Receipt of your Letterhead Request.



## BARNES DRILL CO.

820 CHESTNUT STREET • ROCKFORD, ILLINOIS



MADE IN  
FOR PRODUCTION MACHINE TOOLS IT'S... **ROCKFORD**  
ILLINOIS, U.S.A.

Machinery, September, 1951

# are you **Losing Time** turning jobs like these?

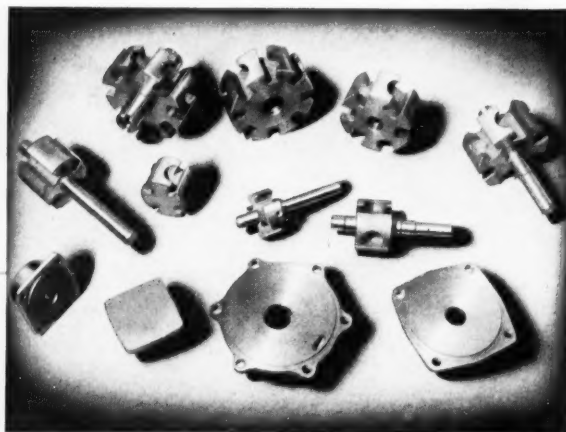
## **SUNDSTRAND Automatic Lathes increase production on both short-run and mass production turning . . .**

These examples of time savings available from Sundstrand Automatic Lathes have been taken from the actual experience of only three of the many users of this mod-

ern equipment. All of the advantages of multiple-tool turning are available on *both* short-run and mass production work. Study these brief examples and compare the production figures with parts similar to yours . . . then get the whole story for equivalent or better savings on turning work in your own plant.

### **Production increased 2½ times on lot sizes of 100 to 500 parts . . .**

Parts are pump rotors and covers. Previously these parts were turned on three conventional turning machines using three operators. A Sundstrand Model 8A Automatic Lathe does the same work 2½ times faster with one operator. Operations include facing, turning and core drilling. Production on cast-iron parts is 120 per hour.



### **13 hours saved on each lot of 20 impellers**



Parts are bronze, range in size from 4" to 10" in diameter. Parts were formerly machined in three operations and three set-ups in 15 hours. Same amount of machining is done in two set-ups on Sundstrand in 2 hours. Turning convex and concave shapes and boring center hole comprise operations.

### **Production increased 70% on 12 different jobs**

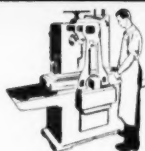
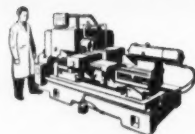
Here are "before" and "after" illustrations of three of 12 different turning jobs on a Model 12A Automatic Lathe. Operations include turning, facing and chamfering. Production increases average from 65% to 70%.



*"Engineered  
Production"  
Service\**

\*REG. U.S. PAT. OFF.

**AUTOMATIC LATHES | SIMPLEX RIGIDMILS | DUPLEX RIGIDMILS**



**MADE IN  
ROCKFORD...FOR ACCURATE, FAST METAL REMOVAL  
ILLINOIS, U.S.A.**

Machinery, September, 1953



## These exclusive features make it possible to obtain this higher production

Seven machine design features govern the possibility of turning short-run work on Automatic Lathes otherwise limited to mass production turning only. They include (1) Wide range of carriage cycles, (2) Adequate feeds and speeds, (3) Quick cycle change, (4) Simplicity of adjustment, (5) Adequate power, (6) Automatic cycling and (7) High rapid traverse rate. Sundstrand Automatic Lathes have all seven. One of the most important of these is:

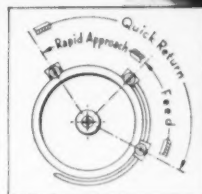
### Wide Range of Tool Action

Straight feed-in type carriage with slow up and dwell and tool relief provides wide range of action for front tools. Many cycle combinations are possible by merely making simple adjustments. Another important feature is:

**Let Sundstrand Engineers help you select the proper Automatic Lathe to suit your work**



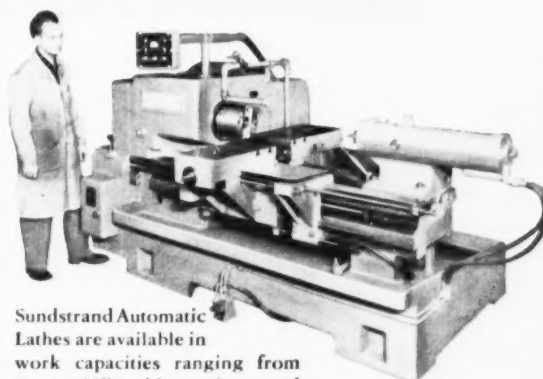
Let our engineers assist in the selection of the proper automatic lathe for your job, and make tooling suggestions for faster turning of *both* short and long-run work. This competent staff of engineers is available to study your problems and suggest changes for increased production, lower costs. Send complete, accurate information with each inquiry.



### Quick Cycle

#### Change for Faster Set-ups

Complete control of all cycles is provided by adjustment of dogs on a disc as shown in above illustration. Making cams is eliminated. Changing position of dogs on disc changes length of rapid approach, feed and rapid return stroke — enables operator to set up cycle quickly and change over from one job to another easily.



Sundstrand Automatic Lathes are available in work capacities ranging from 5 to 75 HP and in varying speed combinations and lengths. Shown above is a Model 12A Automatic Lathe with 50 HP spindle drive motor.

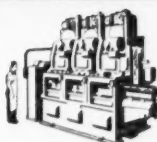
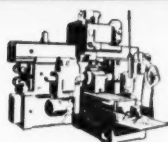
### FREE DATA:

Complete information on Sundstrand Automatic Lathes can be obtained from these booklets. Ask for bulletin 635.



TRIPLEX RIGIDMILS

SPECIAL MACHINES



YOU'LL FIND YOUR PRODUCTION MACHINE TOOLS IN...

Machinery, September, 1953

**SUNDSTRAND  
Machine Tool Co.**

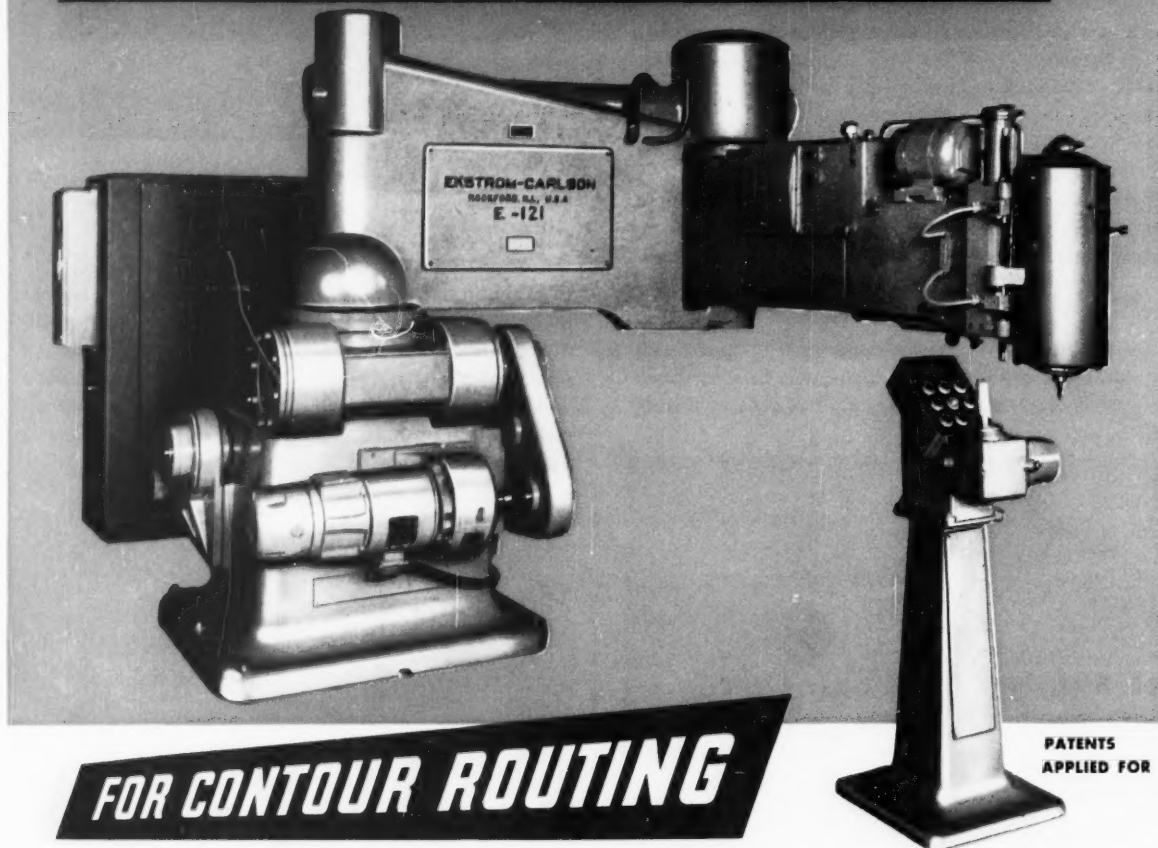
2530 Eleventh St. • Rockford, Ill., U.S.A.

MADE IN

**ROCKFORD  
ILLINOIS, U.S.A.**



**A MARVEL OF SPEED AND POWER!**



**FOR CONTOUR ROUTING**

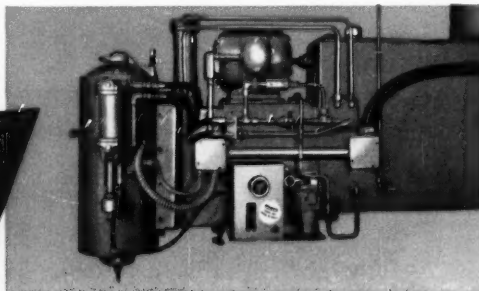
**EKSTROM,  
CARLSON  
E-121  
ELECTRIC**

*Contour Routing  
and  
Milling Machine*

Here is the newest, most advanced machine for contour routing and milling of aluminum slabs or stacks of sheets up to 2" thick — easier and faster than it has ever been done before! The EKSTROM, CARLSON E-121 shown above is an all-electric machine with a simple joy-stick controlling both direction and rate of feed. Now, with a minimum of effort, an easily-trained operator, working at a remote control station, can follow complex templates, do inside or outside routing, control depth of cut accurately, change over quickly from one job to another, break production records, and reduce costs. Write *today* for literature giving complete details.

**EKSTROM, CARLSON & CO.**  
Dept M-4  
1406 Railroad Ave.  
Rockford, Ill.

**by EKSTROM, CARLSON**



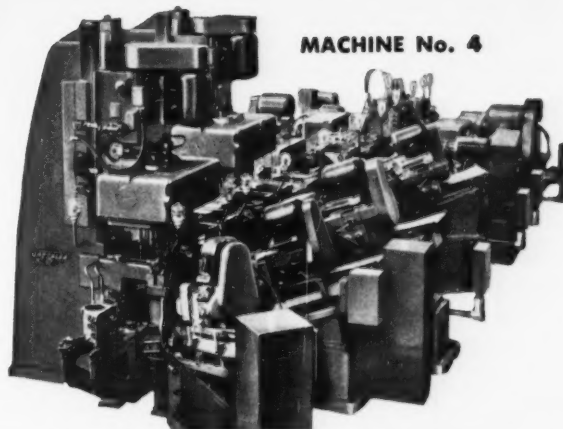
**MADE IN  
ROCKFORD...MACHINE TOOL SHOPPING CENTER  
ILLINOIS, U.S.A.**

*Machinery, September, 1953*



## 208 OPERATIONS IN 44.3 SECONDS

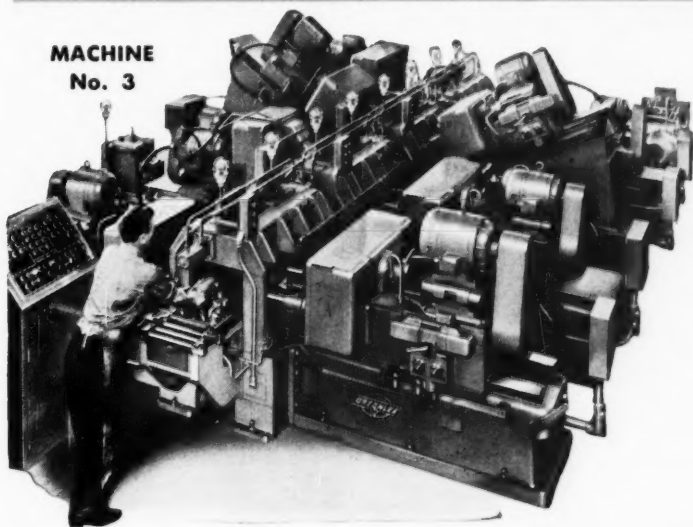
These recently-built Greenlee transfer machines mill, bore, drill, ream, and tap transmission cases for a well-known automobile. A total of 183 tools complete 208 operations in an automatic cycle time of 44.3 seconds. Features include face and end-milling heads, turnover and chip-cleanout stations, and indicator lights for tool changing. Self-contained hydraulic units conform to JIC standards for easy maintenance. These outstanding machines are among the newest built by Greenlee—a pioneer in progressive transfer-machine principles.



MACHINE No. 4

# GREENLEE

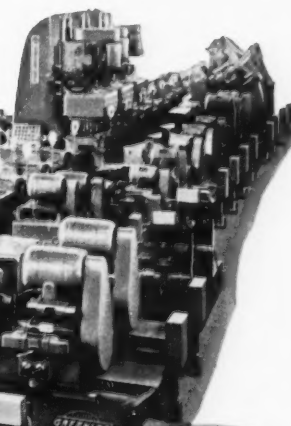
MACHINE  
No. 3



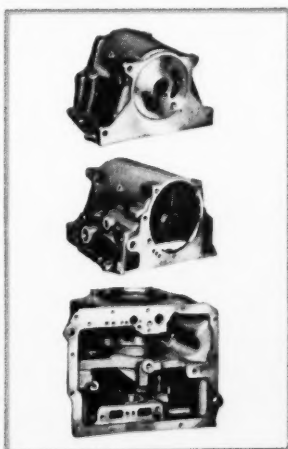
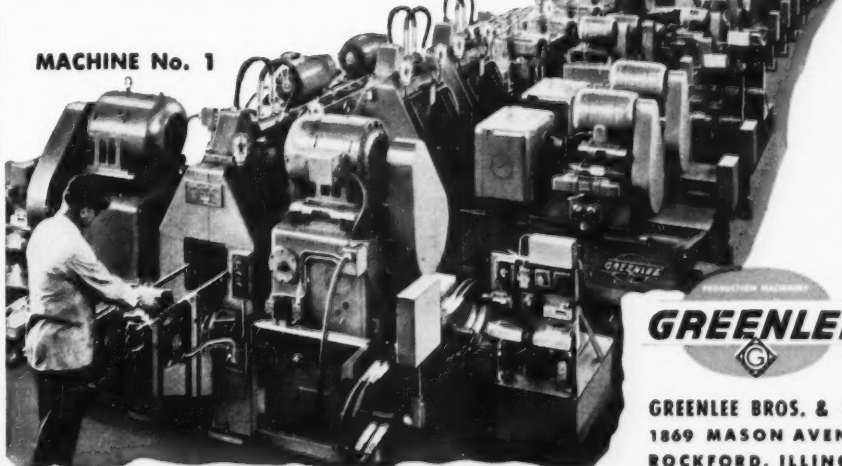
**TRANSFER MACHINES  
PROCESS**

**AUTOMATIC  
TRANSMISSION CASES  
AT THE PRODUCTION RATE OF  
65 CASES PER HOUR**

MACHINE  
No. 2



MACHINE No. 1



**GREENLEE**

GREENLEE BROS. & CO.  
1869 MASON AVENUE  
ROCKFORD, ILLINOIS

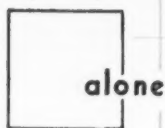
MULTIPLE-SPINDLE DRILLING, BORING, TAPPING MACHINES • AUTOMATIC SCREW MACHINES • AUTOMATIC TRANSFER PROCESSING MACHINES



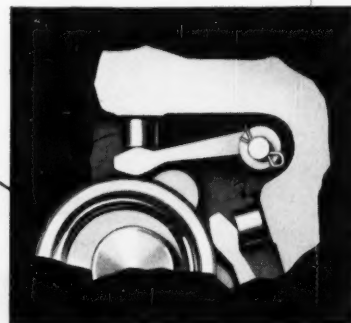
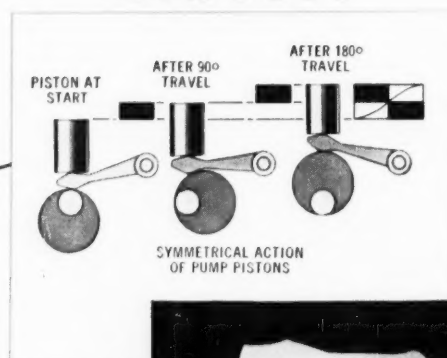
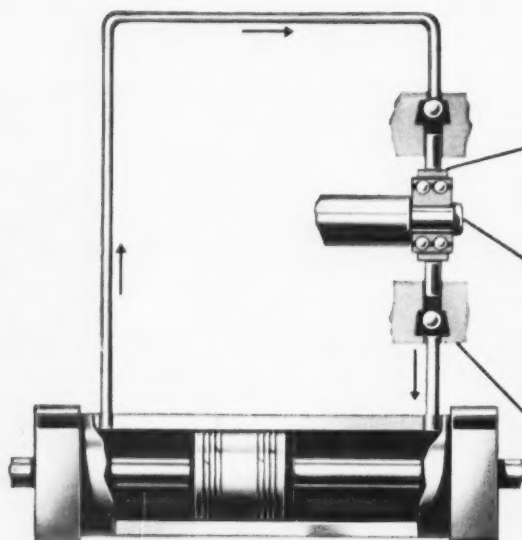
ROCKFORD MADE MEANS PRECISION MADE...

**MADE IN  
ROCKFORD  
ILLINOIS, U.S.A.**

Machinery, September, 1951



# BARNES CLOSED FLUID CIRCUIT



Circuit consists of an actuator having a relatively shiftable piston; a variable displacement pump propelling the actuator at selected speeds; and sealed ducts leading from the actuator to the pump and from the pump to the actuator. This arrangement causes fluid to be sealed within the circuit and maintains fluid pressure on both sides of the actuator. Result — positive control of travel of the actuator piston.

## BRANCH OFFICES

503 New Center Building  
Detroit 2, Michigan  
3254 Lincoln Avenue  
Chicago 13, Illinois  
132 East Hanover Street  
Trenton 8, New Jersey

## SALES REPRESENTATIVES

Rees Machinery Company  
1012 Empire Building  
Pittsburgh 22, Pennsylvania  
B. W. Rogers Company  
850 South High Street  
Akron 9, Ohio

Standard Machine & Tool Co.  
870 Ottawa Street  
Windsor, Ontario, Canada  
W. H. Del Mar Co.,  
3931 W. Slawson Ave.  
Los Angeles 43, California

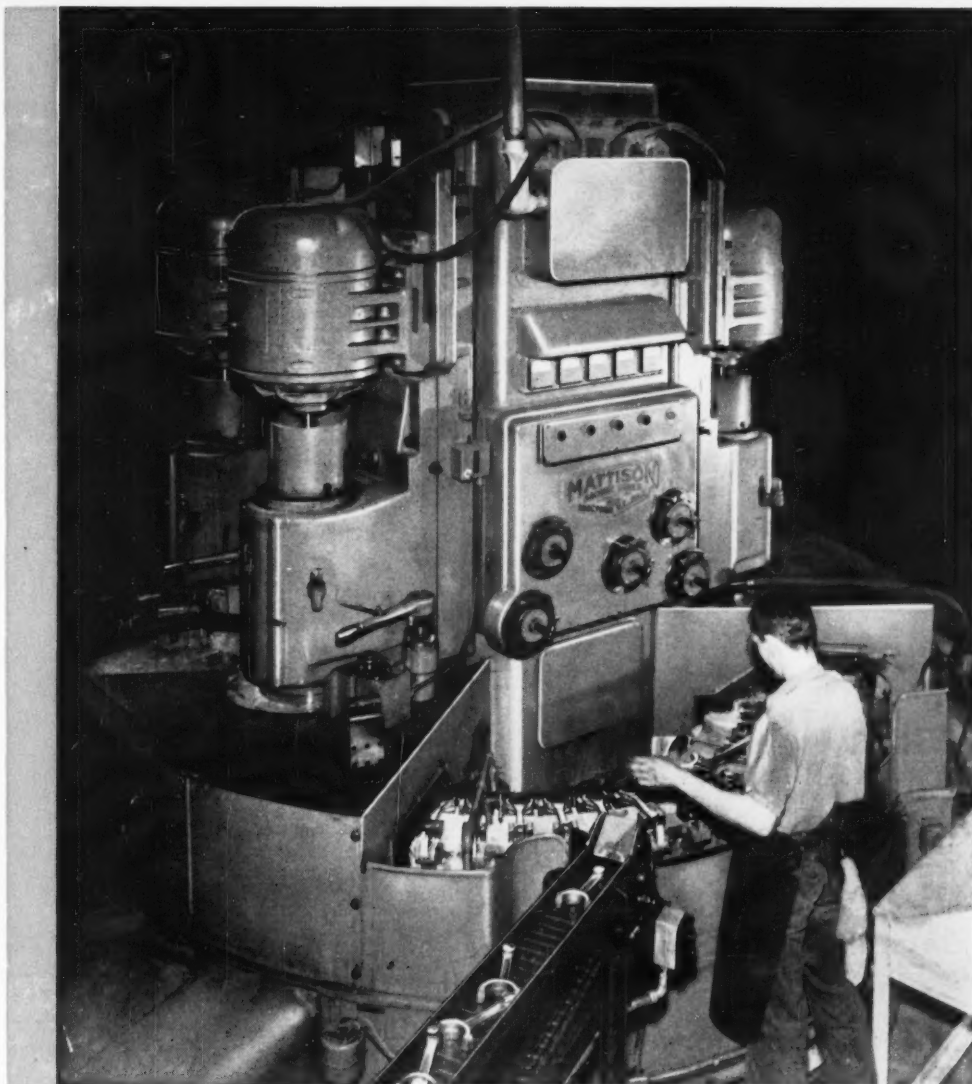
Copyright 1953 by John S. Barnes Corporation

**JOHN S. BARNES CORPORATION • ROCKFORD, ILLINOIS**

**MADE IN  
ROCKFORD...A CONVENIENT SOURCE FOR PRODUCTION NEEDS  
ILLINOIS, U.S.A.**

Machinery, September, 1953





● At the Cleveland Engine Plant of the Ford Motor Company, both sides of wrist-pin and crank-pin bosses are accurately ground on a high production basis with this five wheel Mattison (Hanchett-Type) Vertical-Spindle Automatic Rotary Surface Grinder. Work pieces are held in automatic clamping fixtures. Automatic sizers are constantly in operation checking the work and keeping all pieces within specified tolerances without operator's attention.

This is only one of the many grinders made by Mattison. Whatever your surface grinding problems may be, write us for our recommendations on the proper method and machine for your job.

**MATTISON**

**MACHINE WORKS**

**ROCKFORD · ILLINOIS**



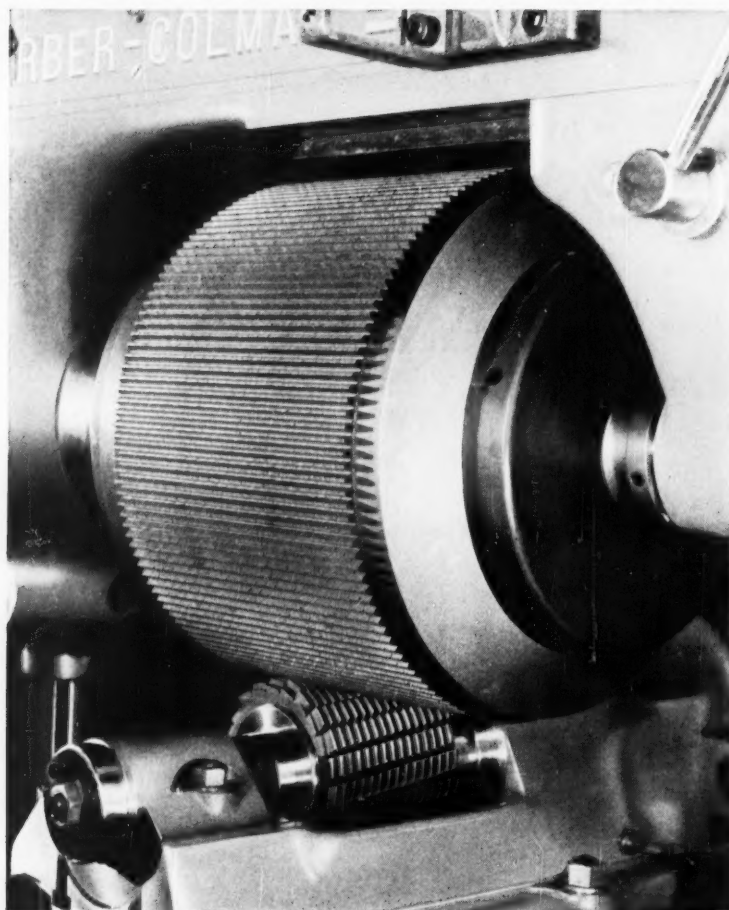
CENTER OF MACHINE TOOL EXCELLENCE...

Machinery, September, 1951

MADE IN

**ROCKFORD**  
**ILLINOIS, U.S.A.**





# Barber-Colman HOBGING BOOSTS RING GEAR PRODUCTION!

1 Gear Every 1-1/2 Minutes

This Barber-Colman No. 14-15 Hobbing Job is typical of how Engineered Hobbing pays off on gear production problems. These flywheel ring gears are nearly 15" in diameter, with 146 teeth and .375" face width. They are hobbled 24 per load at the rate of 36 minutes floor-to-floor, or 1-1/2 minutes per gear. Blanks are formed by rolling flat stock into a ring and butt-welding. The rings are then mounted on specially-designed work arbors and hobbled at .100" feed per revolution and 75 hob rpm.

B U I L D E R S   O F   P R E C I S I O N   G E A R

MADE IN  
**ROCKFORD**...CITY OF MACHINE TOOL SPECIALISTS  
ILLINOIS, U.S.A.

Machinery, September, 1953



### 2300 Gears Per Hob Life

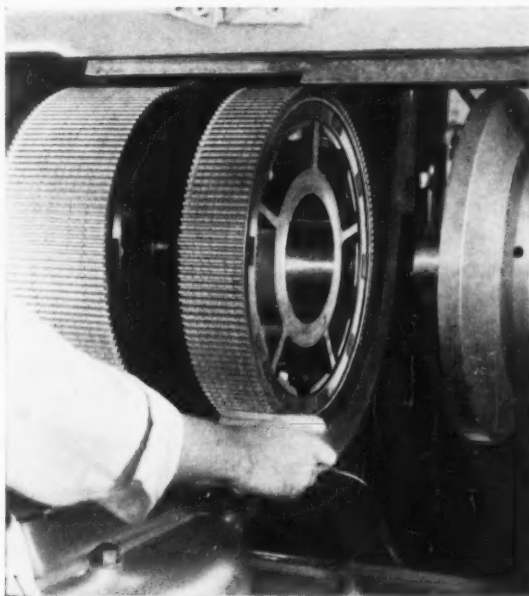
On this job 2300 gears are cut per hob — about 195 pieces per sharpening. Low-cost unground Multithread hobs are used. Multithread design, with its increased indexing speed, has reduced total time to 1-1/2 minutes per gear. Fast loading and automatic hobbing cycle reduce operating costs to a minimum.

## ENGINEERED HOBGING PAYS OFF!

### Tooling Suits Specific Problems

Barber-Colman Engineers designed special mandrels to hold 8 of these large diameter blanks per load. The mandrels are mounted three on the arbor (24 blanks) for each cutting cycle. Blanks are pressed onto the mandrel prior to hobbing, thus reducing loading time between cycles. A special loading fixture aids the operator in lifting and positioning the mandrels on the arbor.

Fast, accurate gear hobbing — with tool costs far below comparable methods — gives you the best possible approach to high-production gear output. Rigidity of the Barber-Colman No. 14-15 Hobbing Machine allows the use of high feed rates and the fast indexing which is inherent with Multithread hobs. Special tooling eliminates job kinks and difficulties. Let Engineered Hobbing work for you, too. Call your Barber-Colman representative and ask him for recommendations on your gear cutting operations.



HOBBS • CUTTERS • REAMERS  
HOBGING MACHINES  
HOB SHARPENING MACHINES



## Barber-Colman Company

GENERAL OFFICES AND PLANT, 629 ROCK STREET, ROCKFORD, ILLINOIS, U.S.A.

H O B S   A N D   M A C H I N E S   S I N C E   1 9 1 1



YOU'LL FIND YOUR PRODUCTION MACHINE TOOLS IN...

**MADE IN**  
**ROCKFORD**  
**ILLINOIS, U.S.A.**

*Machinery, September, 1953*

# Anderson

## STRAIGHTENING PRESS

*for heavy work*

TAKES THE GUESS WORK  
OUT OF STRAIGHTENING



**50 TON  
CAPACITY**

With the ram at one end of the table, a crane can lower heavy work on the table, and the ram moved to where required. The ram rolls on four ball bearing equipped wheels and is easily moved by hand. The table has a "V" slide on which are mounted spring loaded centers and checking rolls. Length of bed and stroke length can be varied to meet customers' needs.

## IMPROVED HAND SCRAPER



Anderson's Model 5 hand scraper is light in weight, easier to use with palm fitting comfort grip, and faster cutting. Three sizes: 18", 20", 22" long. Furnished with high speed steel or Carbide Blades.



Send for  
Bulletin 5-6

**ANDERSON BROS. MFG. CO.**  
1907 Kishwaukee St.  
ROCKFORD, ILLINOIS



**POWER SCRAPER** has a "natural hand control" ... left hand serves as guide to the blade, and the right hand regulates the stroke. A slight forward pressure on cylinder with right hand starts swift, smooth forward stroke which can be regulated from nothing to 3½ feet ... 60 feet per minute, reverse speed 90 feet per minute. Has a ¼ H.P. motor, easily portable. Write for more information today.

**MADE IN  
ROCKFORD... FOR MACHINES DESIGNED TO SUIT YOUR PRODUCTION  
ILLINOIS, U. S. A.**

Machinery, September, 1933

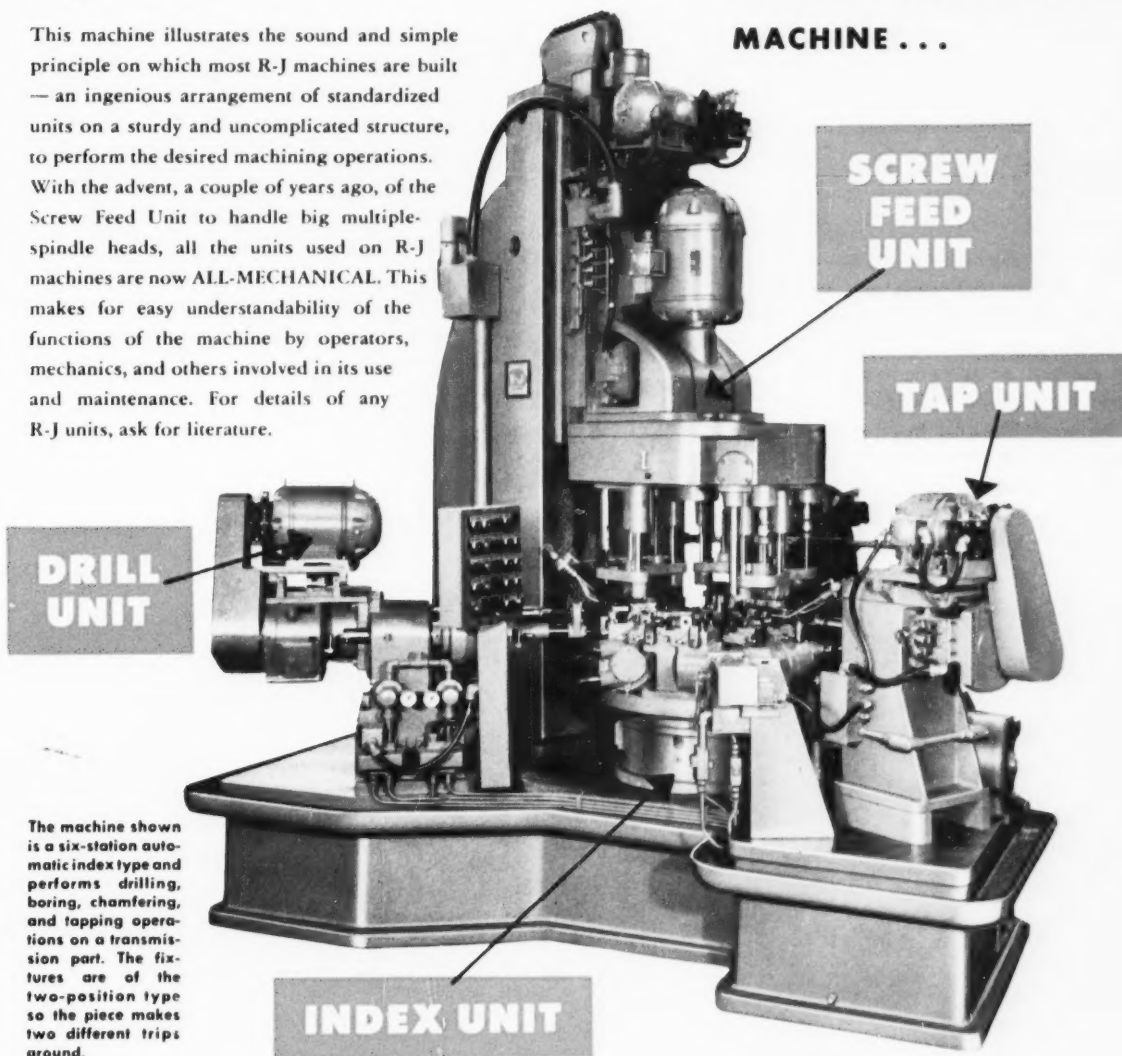


# Rehnberg-Jacobson

## STANDARDIZED *All-Mechanical Units*

HANDLE ALL TOOLS  
AND FIXTURES ON THIS  
MODERN PRODUCTION  
MACHINE . . .

This machine illustrates the sound and simple principle on which most R-J machines are built — an ingenious arrangement of standardized units on a sturdy and uncomplicated structure, to perform the desired machining operations. With the advent, a couple of years ago, of the Screw Feed Unit to handle big multiple-spindle heads, all the units used on R-J machines are now ALL-MECHANICAL. This makes for easy understandability of the functions of the machine by operators, mechanics, and others involved in its use and maintenance. For details of any R-J units, ask for literature.



The machine shown is a six-station automatic index type and performs drilling, boring, chamfering, and tapping operations on a transmission part. The fixtures are of the two-position type so the piece makes two different trips around.

REHNBERG-JACOBSON MFG. COMPANY

DESIGNERS & BUILDERS OF  
SPECIAL MACHINERY



2135 KISHWAUKEE ST.  
ROCKFORD, ILLINOIS



FOR PRODUCTION MACHINE TOOLS IT'S...

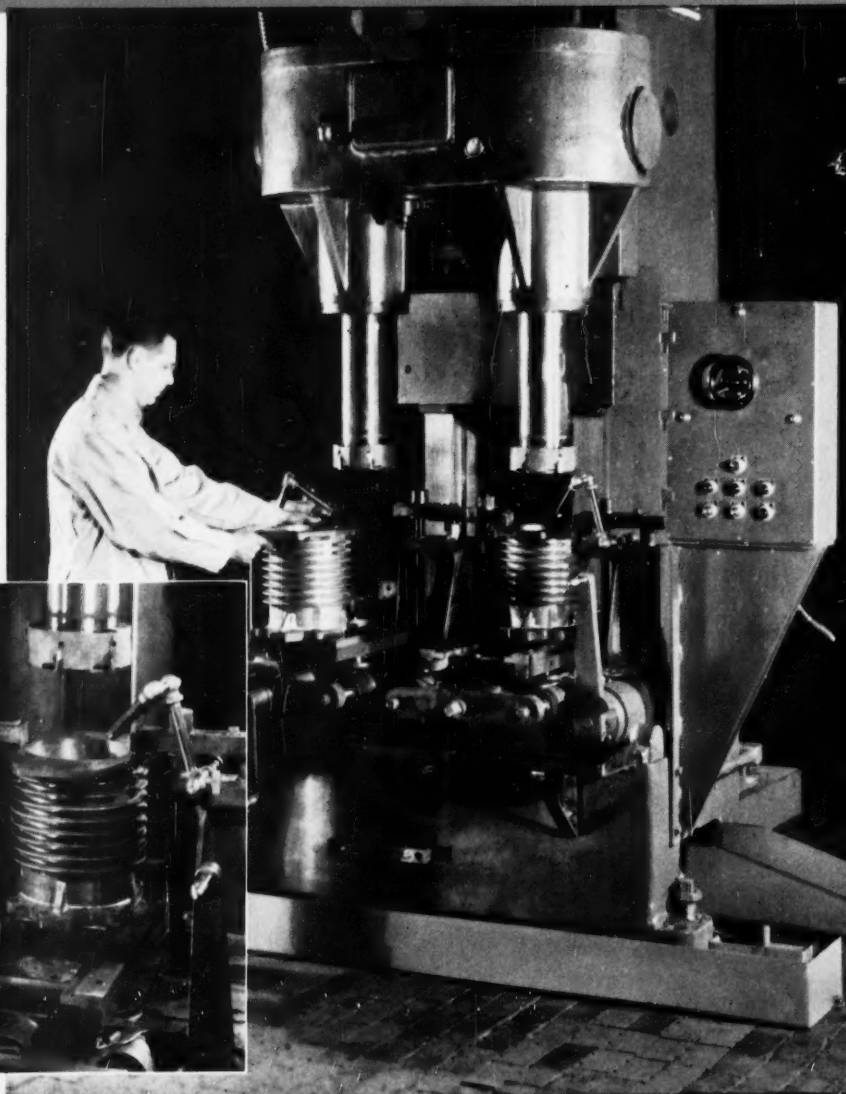
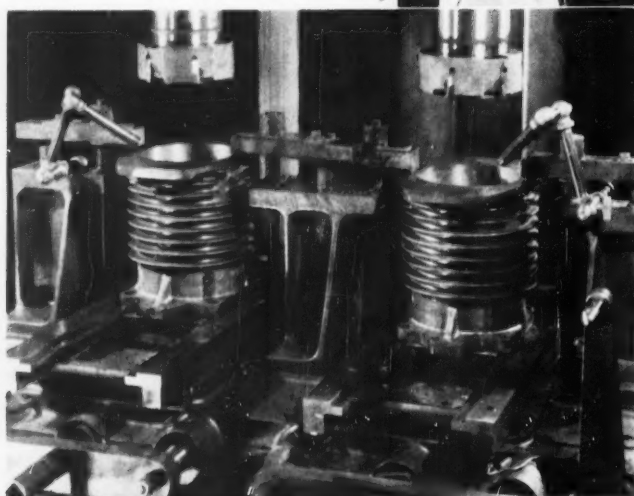
MADE IN  
**ROCKFORD**  
ILLINOIS, U.S.A.

Machinery, September, 1953



# • INGERSOLL

● Ten different types of cast iron compressor cylinders are rough and finish bored on this 14-ton, 25-horsepower machine. It is equipped with two fixtures and two sets of interchangeable spindle assemblies for bore diameters ranging from 4" to 8". Because of the excellent finish obtained, only .003" stock needs to be removed by honing after the finish cut is taken.



THE INGERSOLL MILLING MACHINE

MADE IN  
**ROCKFORD**...MACHINE TOOL PLANTS CLOSE TO YOUR PLANT  
ILLINOIS, U.S.A.

Machinery, September, 1951



● While there is some resemblance between these Ingersoll Vertical Boring Machines, they differ substantially in weight, power, tooling,

# BORING MACHINES **ENGINEERED TO FIT THE JOB**

and fixturing because they were built to meet different work requirements. The machines, fixtures, and tools were built by Ingersoll as integrated operating units. We accepted responsibility for their performance by guaranteeing the production rates and accuracy.

● This 24-ton, 60-horsepower machine rough and finish bores a large size, close-grained cast iron cylinder liner. Ingersoll boring tools with carbide-tipped inserted blades take 5/8" deep roughing cuts in the 12-1/2" bore.



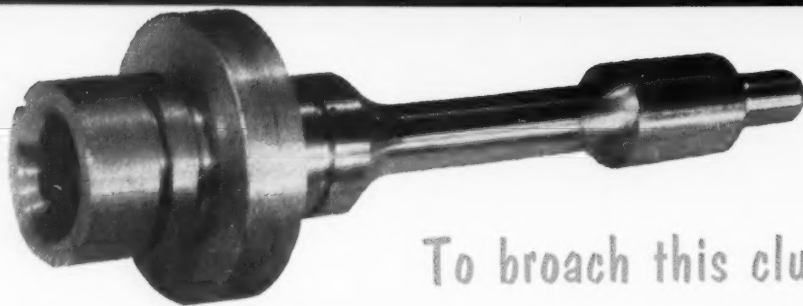
COMPANY • ROCKFORD, ILLINOIS



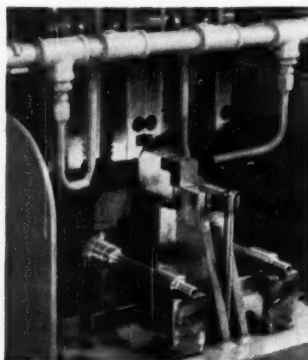
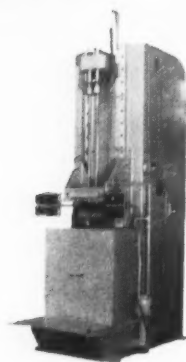
FOR METAL REMOVAL WITH ACCURACY AND SPEED...

**MADE IN**  
**ROCKFORD**  
**ILLINOIS, U.S.A.**

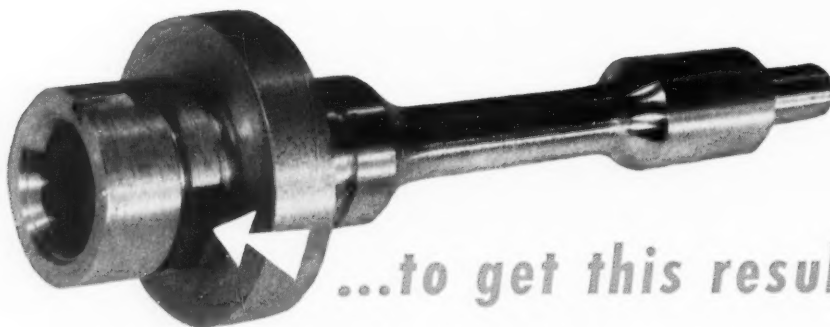
Machinery, September, 1953



To broach this clutch gear...



use this *American* machine... in this fashion...



...to get this result!

Approximately 300 clutch gears per hour can be broached on this American 3-Way Type Vertical Hydraulic Broaching Machine. A two station fixture is provided to locate parts in V-shape locators. Air clamping locks the parts into place. At the end of the broaching stroke the parts are automatically unclamped and the operator unloads them while returning the machine ram to starting position.

Flats approximately 5/16" wide are broached

on the diameter of the large end of the gear.

This broaching operation is a standard operation on a standard American machine. If your problem is more difficult, American has the experience and skill to devise a special machine, fixture or broach for your purposes. Send a part-print or sample for a recommendation leading to a solution of your broaching problem. Or send for catalog #300 which illustrates and describes standard American machines.



*American* BROACH & MACHINE CO.

A DIVISION OF SUNDSTRAND MACHINE TOOL CO.

American Building - Ann Arbor, Michigan

See *American* First — for the Best in Broaching Tools, Broaching Machines, Special Machinery

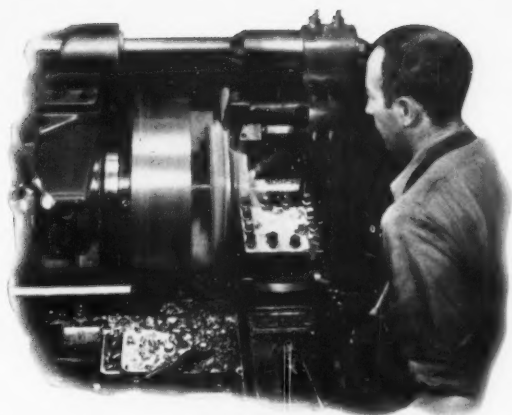


MADE IN

**ROCKFORD**...A CONVENIENT SOURCE FOR PRODUCTION NEEDS  
ILLINOIS, U.S.A.

Machinery, September, 1933





...the shapers of  
things to come —

## ALLEGHENY LUDLUM HIGH SPEED STEEL TOOL BITS



In a complete range of  
tungsten, moly, cobalt,  
and high vanadium types

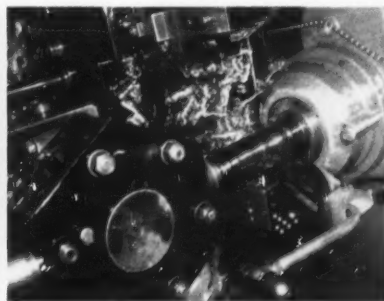
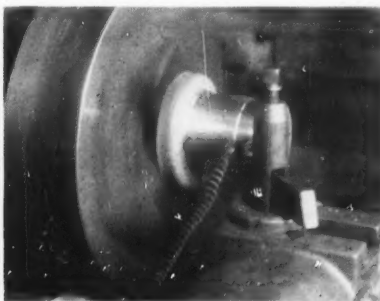
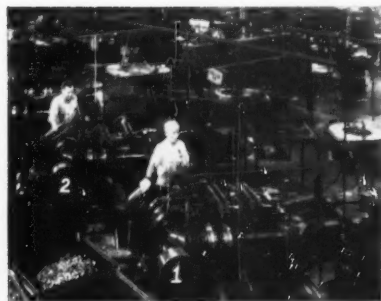
PANTHER 5  
SUPER PANTHER  
PANTHER SPECIAL  
ML, LXX, SUPER DBL  
DBL-3 AND DBL-2

Cut to length . . . bevelled both ends . . . heat-treated to perfection. Just shape the point and you're all ready to go . . . A-L Tool Bits are the last word in convenience.

Made in a complete range of tungsten and moly high speed steels . . . including the new cobalt and high vanadium types that offer superior red hardness, wear-resisting and cutting properties.

Furnished in Standard finish or the popular Ground finish which is extremely accurate in dimension and free from decarburization and scale.

For real Johnny-on-the-spot service on the finest tool bits obtainable, call your local A-L office or distributor . . . **TODAY!** • *Allegheny Ludlum Steel Corporation, Oliver Building, Pittsburgh 22, Pa.*



For complete **MODERN** Tooling, call  
**Allegheny Ludlum**





# CHASE<sup>®</sup>

## *free-cutting brass rod*



**means  
longer life  
for your tools**

Chase Free-Cutting Brass rod yields short chips as it is machined. The result is much easier cutting, longer tool life. Products produced are smoother, cleaner-surfaced, less expensive to buff or polish before lacquering, enameling or plating.

Fine quality Chase rod and drawn bar are available in a wide variety of free-cutting copper alloys. They are always uniform so that repeat orders have the same cutting characteristics.

For rod and bar, for finer products at lower unit cost, call the Chase warehouse nearest you.

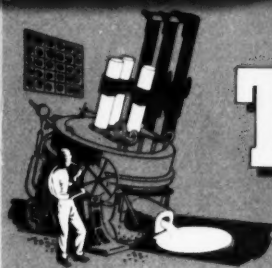
# Chase<sup>®</sup>

## **BRASS & COPPER**

*The Nation's Headquarters for Brass & Copper*

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| Boston     | Detroit      | Minneapolis      | Providence   |                     |
| Chicago    | Houston      | Newark           | Rochester    |                     |
| Cincinnati | Indianapolis | New Orleans      | St. Louis    | (sales office only) |



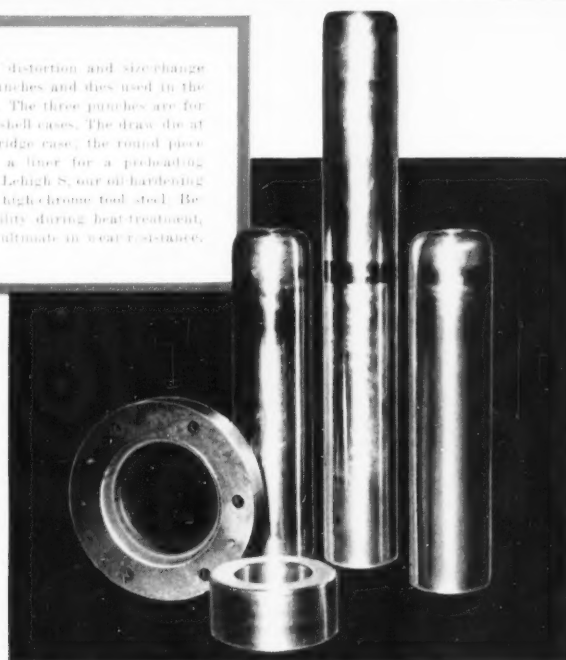
# Tool Steel Topics



BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributors: Bethlehem Steel Export Corporation

Only the minimum of distortion and size change can be tolerated on punches and dies used in the cold extruding of steel. The three punches are for cold-drawing 105 mm shell cases. The draw die at left is for a 5-in. cartridge case; the round piece in the foreground is a liner for a preheating die. All are made from Lehigh S, our oil-hardening grade of high-carbon, high-chrome tool steel. Besides its inherent stability during heat treatment, Lehigh S provides the ultimate in wear resistance.



## There's no such thing as a non-deforming tool steel

Shrinkage, growth, and warpage—all occur when a tool is heated for hardening. There just isn't a tool steel which is "non-deforming" in the absolute sense of the term.

It's downright discouraging when an accurately machined tool or die emerges from the heat treating furnace with its shape distorted or its dimensions way beyond the allowable tolerances. Yet, this experience is quite common.

In many instances the change in size caused by heat treatment is not so great as to cause any trouble. Proper grinding, to remove scale and to obtain exact tool dimensions, is often all that is necessary. However, excessive warpage or size change can make it costly, even impossible, to restore a tool to the proper shape or correct dimensions, either by grinding or by corrective heat treatment.

It's obviously important for both tool makers and heat-treaters to understand the causes of distortion and how it can be controlled within reasonable limits. The design of tools, the grade of tool steel

used, and heat treatment procedures—all these factors have a bearing on the degree of distortion which will occur.

Warpage, for example, is usually a factor associated with the geometrical shape of a tool and with the thermal stresses produced by lack of uniformity in heating or cooling operations. The composition of a tool steel has very little to do with the occurrence of warpage.

On the other hand, the growth or shrinkage of tools is the result of volume changes caused by the hardening operation. Each grade of steel has certain characteristics of inherent distortion. And it varies considerably with the composition. Carbon tool steel, for example, has a distortion "factor" of approximately .002 to .004 in. on the plus side. A high carbon, high chromium grade, such as our Lehigh H, has a factor of only .0005 in., plus or minus.

If you'd like a printed discussion of this subject write to our Publications Dept. at Bethlehem, Pa., for the booklet "Distortion of Tool Steels in Heat Treatment."

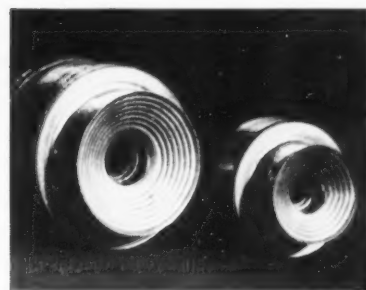
### BETHLEHEM TOOL STEEL ENGINEER SAYS:



*Avoid drastic changes of section in tool design*

You can expect trouble whenever a tool made of a liquid quenched steel is designed so that heavy and light sections are adjacent. When such a tool is quenched, the light sections cool rapidly and harden before the adjacent heavy sections. Quenching stresses are set up which often exceed the strength of the steel. Cracking is the result.

Although such tools fail during heat treatment, poor tool design must take the blame. Troubles of this sort are sometimes avoided by differential hardening or making this type of tool as a two piece assembly. But if a one piece construction is necessary, then it's best to use an air-hardening steel.



### FOR TOOTHPASTE TUBES

These intricately machined dies are used in shaping the tapered neck and tip of toothpaste tubes which are extruded from round slugs of aluminum. When a punch is driven downward towards the die, the aluminum "biscuit" is trapped between the punch tip and the die and is extruded by the heavy pressure, flowing upwards along the cylindrical punch to form the tube body.

The dies pictured are made from our 67 Chisel tool steel, a chrome-tungsten grade of shock resisting steel that's ideal for tools and dies requiring plenty of impact strength. Although it is principally a shock type of steel, 67 Chisel is readily carburized whenever extra wear resistance is needed... without sacrificing the advantages of its tough core.

Easy to machine and heat treat, 67 Chisel is stocked by distributors of Bethlehem tool steel in principal cities.

# You get **more parts** per hour

**PRODUCTION INCREASED 50%  
COSTS REDUCED 11.6%**

**MACHINE TEST REPORT**

Machine Name: \_\_\_\_\_  
Part Name: \_\_\_\_\_  
Machine Operations: \_\_\_\_\_  
Machine Speed: \_\_\_\_\_  
Machine Size: \_\_\_\_\_  
Machine Weight: \_\_\_\_\_

**COMPARATIVE PRODUCTION**

| GRADE | ITEM | QTY | TIME | UNIT | TIME | UNIT | TIME | UNIT |
|-------|------|-----|------|------|------|------|------|------|
| 10    | 1    | 1   | 1    | 1    | 1    | 1    | 1    | 1    |
| 10    | 2    | 1   | 1    | 1    | 1    | 1    | 1    | 1    |
| 10    | 3    | 1   | 1    | 1    | 1    | 1    | 1    | 1    |
| 10    | 4    | 1   | 1    | 1    | 1    | 1    | 1    | 1    |
| 10    | 5    | 1   | 1    | 1    | 1    | 1    | 1    | 1    |
| 10    | 6    | 1   | 1    | 1    | 1    | 1    | 1    | 1    |
| 10    | 7    | 1   | 1    | 1    | 1    | 1    | 1    | 1    |
| 10    | 8    | 1   | 1    | 1    | 1    | 1    | 1    | 1    |
| 10    | 9    | 1   | 1    | 1    | 1    | 1    | 1    | 1    |
| 10    | 10   | 1   | 1    | 1    | 1    | 1    | 1    | 1    |

**ESTIMATE OF COMPARATIVE COSTS**

| ITEM | UNIT | TIME | UNIT | TIME | UNIT | TIME | UNIT | TIME |
|------|------|------|------|------|------|------|------|------|
| 10   | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    |
| 10   | 2    | 1    | 1    | 1    | 1    | 1    | 1    | 1    |
| 10   | 3    | 1    | 1    | 1    | 1    | 1    | 1    | 1    |
| 10   | 4    | 1    | 1    | 1    | 1    | 1    | 1    | 1    |
| 10   | 5    | 1    | 1    | 1    | 1    | 1    | 1    | 1    |
| 10   | 6    | 1    | 1    | 1    | 1    | 1    | 1    | 1    |
| 10   | 7    | 1    | 1    | 1    | 1    | 1    | 1    | 1    |
| 10   | 8    | 1    | 1    | 1    | 1    | 1    | 1    | 1    |
| 10   | 9    | 1    | 1    | 1    | 1    | 1    | 1    | 1    |
| 10   | 10   | 1    | 1    | 1    | 1    | 1    | 1    | 1    |

Note: These data represent data from the latest of the group of output data for direct labor and machine overhead and machine efficiency, used by a representative stock machine shop.



**PRODUCTION INCREASED 51.6%  
COSTS REDUCED 17.3%**

**MACHINE TEST REPORT**

Machine Name: \_\_\_\_\_  
Part Name: \_\_\_\_\_  
Machine Operations: \_\_\_\_\_  
Machine Speed: \_\_\_\_\_  
Machine Size: \_\_\_\_\_  
Machine Weight: \_\_\_\_\_

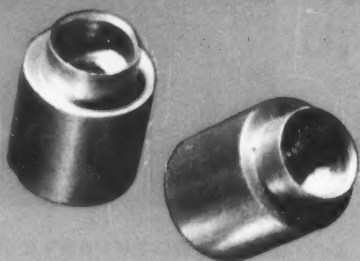
**COMPARATIVE PRODUCTION**

| GRADE | ITEM | QTY | TIME | UNIT | TIME | UNIT | TIME | UNIT |
|-------|------|-----|------|------|------|------|------|------|
| 10    | 1    | 1   | 1    | 1    | 1    | 1    | 1    | 1    |
| 10    | 2    | 1   | 1    | 1    | 1    | 1    | 1    | 1    |
| 10    | 3    | 1   | 1    | 1    | 1    | 1    | 1    | 1    |
| 10    | 4    | 1   | 1    | 1    | 1    | 1    | 1    | 1    |
| 10    | 5    | 1   | 1    | 1    | 1    | 1    | 1    | 1    |
| 10    | 6    | 1   | 1    | 1    | 1    | 1    | 1    | 1    |
| 10    | 7    | 1   | 1    | 1    | 1    | 1    | 1    | 1    |
| 10    | 8    | 1   | 1    | 1    | 1    | 1    | 1    | 1    |
| 10    | 9    | 1   | 1    | 1    | 1    | 1    | 1    | 1    |
| 10    | 10   | 1   | 1    | 1    | 1    | 1    | 1    | 1    |

**ESTIMATE OF COMPARATIVE COSTS**

| ITEM | UNIT | TIME | UNIT | TIME | UNIT | TIME | UNIT | TIME |
|------|------|------|------|------|------|------|------|------|
| 10   | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    |
| 10   | 2    | 1    | 1    | 1    | 1    | 1    | 1    | 1    |
| 10   | 3    | 1    | 1    | 1    | 1    | 1    | 1    | 1    |
| 10   | 4    | 1    | 1    | 1    | 1    | 1    | 1    | 1    |
| 10   | 5    | 1    | 1    | 1    | 1    | 1    | 1    | 1    |
| 10   | 6    | 1    | 1    | 1    | 1    | 1    | 1    | 1    |
| 10   | 7    | 1    | 1    | 1    | 1    | 1    | 1    | 1    |
| 10   | 8    | 1    | 1    | 1    | 1    | 1    | 1    | 1    |
| 10   | 9    | 1    | 1    | 1    | 1    | 1    | 1    | 1    |
| 10   | 10   | 1    | 1    | 1    | 1    | 1    | 1    | 1    |

Note: These data represent data from the latest of the group of output data for direct labor and machine overhead and machine efficiency, used by a representative stock machine shop.



**PRODUCTION INCREASED 29%  
COSTS REDUCED 8.0%**

**MACHINE TEST REPORT**

Machine Name: \_\_\_\_\_  
Part Name: \_\_\_\_\_  
Machine Operations: \_\_\_\_\_  
Machine Speed: \_\_\_\_\_  
Machine Size: \_\_\_\_\_  
Machine Weight: \_\_\_\_\_

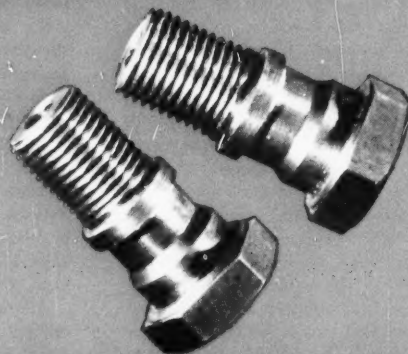
**COMPARATIVE PRODUCTION**

| GRADE | ITEM | QTY | TIME | UNIT | TIME | UNIT | TIME | UNIT |
|-------|------|-----|------|------|------|------|------|------|
| 10    | 1    | 1   | 1    | 1    | 1    | 1    | 1    | 1    |
| 10    | 2    | 1   | 1    | 1    | 1    | 1    | 1    | 1    |
| 10    | 3    | 1   | 1    | 1    | 1    | 1    | 1    | 1    |
| 10    | 4    | 1   | 1    | 1    | 1    | 1    | 1    | 1    |
| 10    | 5    | 1   | 1    | 1    | 1    | 1    | 1    | 1    |
| 10    | 6    | 1   | 1    | 1    | 1    | 1    | 1    | 1    |
| 10    | 7    | 1   | 1    | 1    | 1    | 1    | 1    | 1    |
| 10    | 8    | 1   | 1    | 1    | 1    | 1    | 1    | 1    |
| 10    | 9    | 1   | 1    | 1    | 1    | 1    | 1    | 1    |
| 10    | 10   | 1   | 1    | 1    | 1    | 1    | 1    | 1    |

**ESTIMATE OF COMPARATIVE COSTS**

| ITEM | UNIT | TIME | UNIT | TIME | UNIT | TIME | UNIT | TIME |
|------|------|------|------|------|------|------|------|------|
| 10   | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    |
| 10   | 2    | 1    | 1    | 1    | 1    | 1    | 1    | 1    |
| 10   | 3    | 1    | 1    | 1    | 1    | 1    | 1    | 1    |
| 10   | 4    | 1    | 1    | 1    | 1    | 1    | 1    | 1    |
| 10   | 5    | 1    | 1    | 1    | 1    | 1    | 1    | 1    |
| 10   | 6    | 1    | 1    | 1    | 1    | 1    | 1    | 1    |
| 10   | 7    | 1    | 1    | 1    | 1    | 1    | 1    | 1    |
| 10   | 8    | 1    | 1    | 1    | 1    | 1    | 1    | 1    |
| 10   | 9    | 1    | 1    | 1    | 1    | 1    | 1    | 1    |
| 10   | 10   | 1    | 1    | 1    | 1    | 1    | 1    | 1    |

Note: These data represent data from the latest of the group of output data for direct labor and machine overhead and machine efficiency, used by a representative stock machine shop.



at **lower cost** per part

...when you do  
the job with

**MX**

*today's faster-cutting screw stock*

● You don't have to take our word for it. When we tell you that U-S-S Free-Machining MX will increase your production and that it will cut the cost of any part you now machine from ordinary Bessemer screw stock, we have the FACTS to back us up . . . figures that speak for themselves.

In the three years that this high speed, free-cutting bar stock has been on the market, hundreds of shops have put it to the test. Although the more than a billion parts made with MX have been of infinite variety and have been produced under dissimilar conditions and on screw machine equipment of different types—the results obtained have been similar.

Here is what has happened in shop after shop: Output per machine, per hour, per man, has been increased. Time between tool grindings

has been extended. Parts finish has been better. Close dimensional accuracy has been easier to obtain. Rejections have been fewer.

And despite its better performance, MX costs no more than ordinary screw stock. Consequently, savings with MX have been invariably recorded. These savings have averaged between 10 and 15%, but also have run as high as 42%. Can you afford to give your competition this edge on you?

Give U-S-S Free-Machining MX a thorough trial. Produced in all the popular screw stock sizes, it is sold in cold-finished form by your regular supplier either as "MX" or under his own identifying trade name. In hot-rolled form MX is available direct through our nearest district sales office.



UNITED STATES STEEL CORPORATION, PITTSBURGH • AMERICAN STEEL & WIRE DIVISION, CLEVELAND  
COLUMBIA GENEVA STEEL DIVISION, SAN FRANCISCO • TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.  
UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS, COAST-TO-COAST  
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

3-495

**UNITED STATES STEEL**





Here are two of our basic electric steel furnaces.

## NATIONAL FORGE *ELECTRIC* STEEL

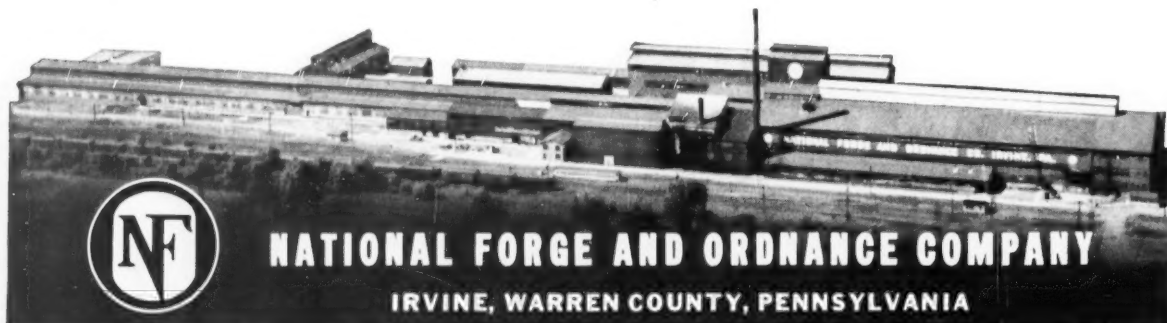
... is used exclusively in all of our forgings. This is to your distinct advantage when you have your forgings National forged.

Electric Steel can be held to close chemical analysis; it is cleaner; it has lower sulphur and phosphorous content and is more uniform from heat to heat.

These qualities of our steel have enabled us to pro-

duce forgings for the armed forces that consistently meet their most exacting specifications.

Your forgings will receive the same meticulous care throughout. So why not have them National forged next time? We offer our facilities and experience for your service; just write **NATIONAL FORGE AND ORDNANCE CO.**, Irvine, Warren County, Penna.



**NATIONAL FORGE AND ORDNANCE COMPANY**  
IRVINE, WARREN COUNTY, PENNSYLVANIA

## Custom made for your forging job



### *Another reason why you get uniform, high quality forgings with TIMKEN® forging steels!*

**Y**OUR order for Timken® forging steels is handled individually in our mills. Conditioning procedure is targeted to your particular forging requirements. You get just the steel you want for uniform forgings, rejects are held to a minimum. And you save steel, because the good dimensional tolerances of Timken steel forging bars produce uniform weight multiples with minimum steel lost in flashings.

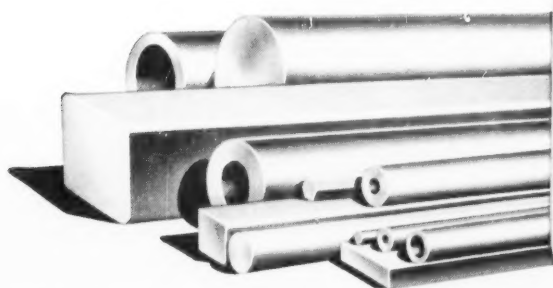
Timken forging steels give you uniform physical properties. They respond uniformly to heat treatment—from bar to bar and heat to heat. Fewer furnace adjustments are needed. And Timken forging steels have uniform grain size after heat treatment. Result: your

forgings have uniformly high ductility and resistance to impact.

Chemical properties, too, are kept uniform in every lot of Timken forging steels by some of the most precise quality control methods known. For example, a direct-reading spectrometer—first of its kind in the steel industry—chemically analyzes a molten heat of Timken forging steel in just 40 seconds! And the melt shop has the complete analysis report within 10 minutes!

For help in improving the quality of your forgings, and cutting production costs, too, write The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH

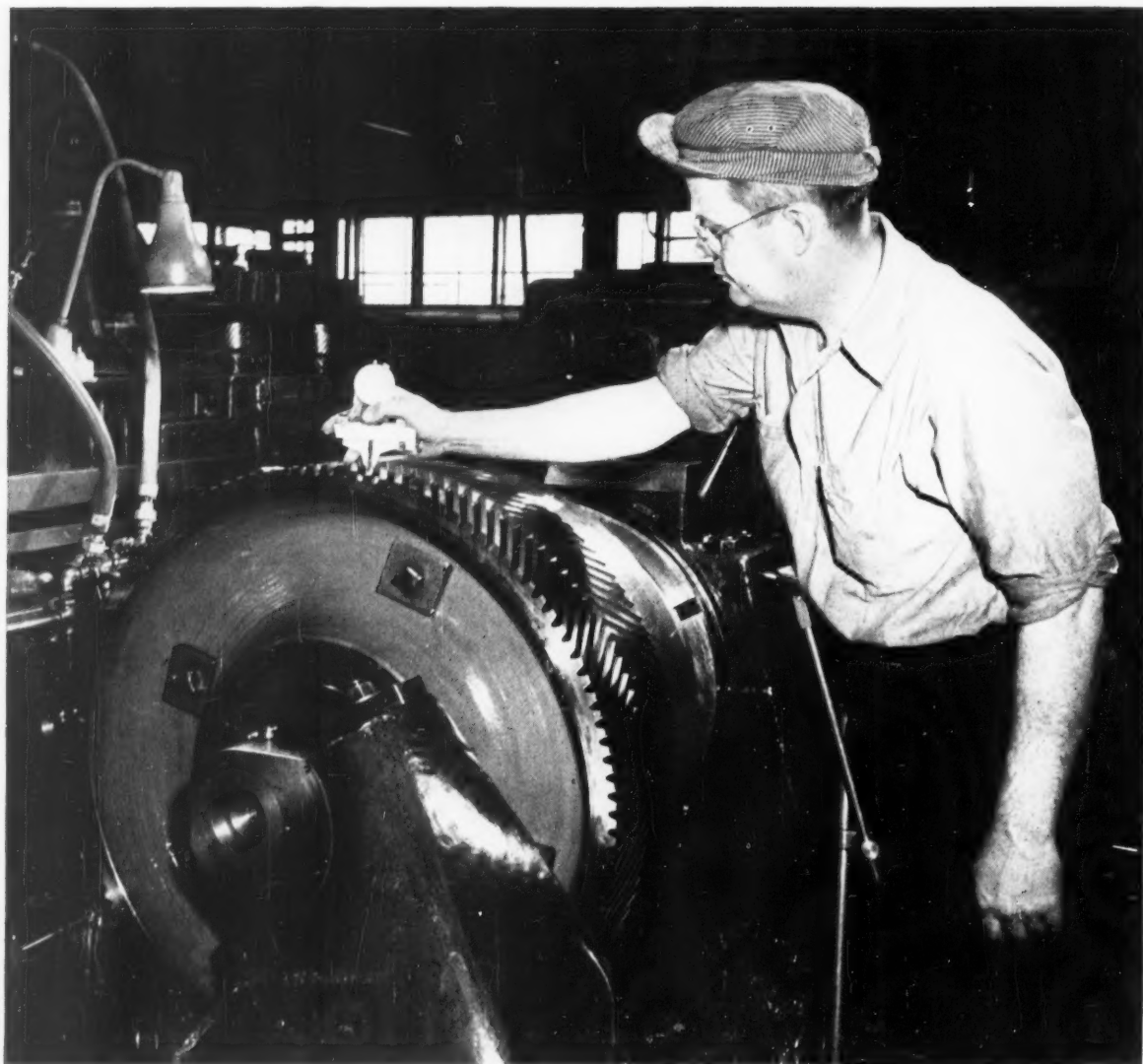


**TIMKEN**  
TRADE MARK REG. U.S. PAT. OFF.  
**Fine Alloy**  
**STEEL**

SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS TUBING

For more information on products advertised, use Inquiry Card, page 239

MACHINERY, September, 1953—95



## Customers Tell Us Why They Like These Gear Blanks

Not long ago, we decided to investigate customer opinions of Bethlehem forged-and-rolled gear blanks. We asked some pretty direct questions, two of them being "Why do you specify Bethlehem gear blanks? What advantages have you found in these products?"

Here are a few of the answers:

- ✧ "Ease of machining and uniform finish allowance on OD, bore, and faces."
- ✧ "The solid, clean metal in the forged blanks is particularly appreciated in tooth-cutting operations on herringbone gear generators, gear shapers, or hobbing machines."
- ✧ "Fewer finishing cuts are required, and the cutting speed is usually higher."
- ✧ "There is almost never a rejection after cutting gear teeth."
- ✧ "The uniform finish allowance all over permits fast, uniform chucking or mounting in the machine."
- ✧ "The blanks are stronger, sounder, better able to withstand shocks."

The chances are, you would find Bethlehem forged-and-rolled blanks equally advantageous in meeting your own requirements. They are available in sizes from 10 to 42 in. OD, heat-treated or untreated, and are strongly recommended for spur, bevel, miter, and herringbone gears. Why not investigate? We feel that your own experience with these blanks will bear out fully what other users say about them.

BETHLEHEM STEEL COMPANY  
BETHLEHEM, PA.

*On the Pacific Coast Bethlehem products are sold by  
Bethlehem Pacific Coast Steel Corporation, Export  
Distributor; Bethlehem Steel Export Corporation*



WHAT IS YOUR  
TOUGHEST  
METAL CLEANING JOB?

HAVE YOU  
TRIED THE NEW  
OAKITE MATERIAL  
FOR IT?

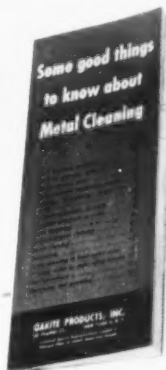
**Oakite has  
new materials for  
many tough jobs**

1. Heavy-duty cleaning in tanks
2. Cleaning sensitive metals
3. Etch-cleaning aluminum
4. Washing in pressure-spray machines
5. Electrocleaning zinc-base die castings
6. Cleaning magnesium alloys
7. Putting heavy phosphate coatings on steel in preparation for painting
8. Pickling and conditioning for painting in one operation
9. Cleaning, pickling and conditioning for painting in one operation
10. Stripping paint
11. "Killing" paint in spray booth wash water
12. Drawing and forming

During the past year, the Oakite Chemical Research Laboratory has produced 16 new or improved materials for performing 12 difficult metal-cleaning jobs and related operations.

One of these new materials may be the perfect answer for some metal-cleaning problem that's been giving you a lot of trouble. Just check the list of cleaning jobs, then circle the corresponding number in the coupon, and we'll be glad to tell you about the new chemical designed for your work.

**FREE** Our 44-page illustrated booklet "Some good things to know about Metal Cleaning" has been revised to discuss the applications of the 16 new materials.



SPECIALIZED INDUSTRIAL CLEANING  
**OAKITE**  
MATERIALS • METHODS • SERVICE

Technical Service Representatives Located in  
Principal Cities of United States and Canada

OAKITE PRODUCTS, INC., 26 Rector St., New York 6, N. Y.

Send me a FREE copy of your booklet  
"Some good things to know about Metal Cleaning."  
I am especially interested in some of the metal-cleaning jobs listed in your  
advertisement. Please give me more information about the new Oakite materials  
for the jobs indicated by the numbers circled below:

|   |   |   |    |    |    |
|---|---|---|----|----|----|
| 1 | 2 | 3 | 4  | 5  | 6  |
| 7 | 8 | 9 | 10 | 11 | 12 |

Name \_\_\_\_\_  
Company \_\_\_\_\_  
Address \_\_\_\_\_



## News About Created-Metals

### New "Brief-A-Log" Simplifies Ordering

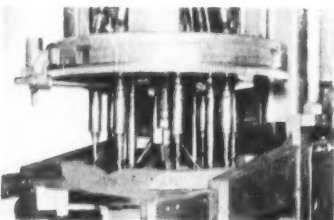


A new condensed catalog and price list is being offered by the Carboloy Department of General Electric Company.

This "Brief-A-Log" (GT-265) incorporates Carboloy price reductions made June 22, and latest additions to the standard lines of tools and blanks.

Designed to simplify selecting and ordering, the Brief-A-Log is available free of charge. (Send coupon at right.)

### Drill Cast Iron with Carbide Twist Drills



Drilling cast iron with carbide twist drills is definitely past the "maybe" stage. Users report doubled production, more than tripled drill life over H.S.S. drills, without any special drilling equipment or job engineering. Sound, how-to-do-it technical bulletins available free. Write Carboloy Department of General Electric Company. (See address at right.)

### New Applications for Carbide Press Dies

Carboloy carbide dies are being profitably applied to blanking and piercing operations where production runs are high.



These dies are economical to use because they produce burr-free, close-tolerance work . . . outlast steel dies by 8 to 10 times.

Write for free Carboloy Die Engineering Manual D-124. (See address at right.)

YOUR CARBOLOY FIELD ENGINEER SAYS . . .

## "Large, costly special



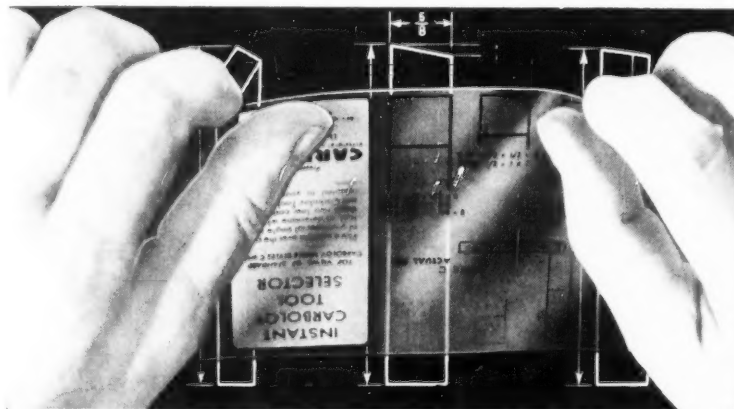
### "Cut your special single-point tool stocks up to 30% with this simple-to-use MTI Plan

"The Minimum Tool Inventory Plan is based on the fact that the 11 Standard Carboloy Tools can be adapted to up to 80% of your special single-point jobs . . . thus eliminating many costly, made-to-print tools.

"The MTI Plan will show you which 'specials' can be eliminated, and exactly how much you'll save. With the 15% price reduction on Standard Carboloy Cemented Carbide Tools, in effect since June 22, now, more than ever before, it pays to standardize."

Send the coupon at right, attached to your company letterhead, for your free MTI Plan Kit. Then, determine your own benefits from the MTI Plan as follows:

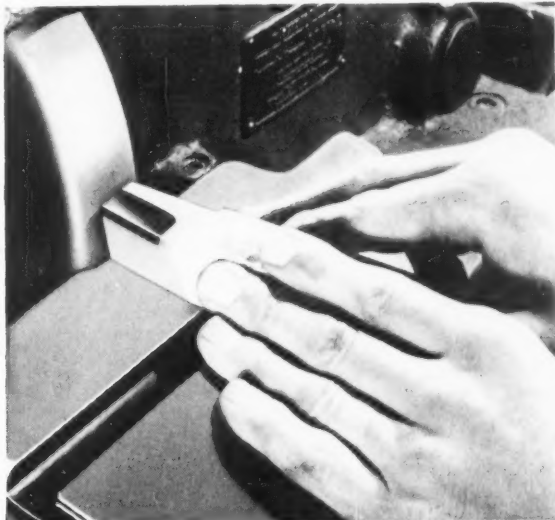
1. Using the Instant Tool Selectors, you'll see at a glance how only 11 Standard Carboloy Tools can be easily and quickly adapted to handle 4 out of 5 of your special, made-to-print tool jobs.



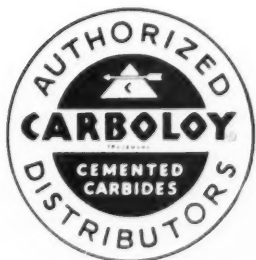
# ***inventories of tools now unnecessary"***



**2.** With the handy Plan Sheet provided, you'll quickly get a dollars-and-cents answer showing how much you'll save by standardizing. Simple subtraction shows you how much your inventories can be cut by using standards.



**3.** Order the Standard Tools you'll need from your local Authorized Carbology Distributor. Use them "as is," or quickly grind them to your specifications. Grinding hints, price lists and Standard Tool specifications are included in Kit.



**CARBOLOY TOOLS ARE STOCKED  
COAST TO COAST**

Look under "Tools" in the Yellow Pages of your local telephone book or in Thomas' Register for your nearby Carbology Distributor. He has complete local stocks and services. Ask him about the MTI Plan.

"Carbology" is the registered trademark for the products of the Carbology Department of General Electric Company.

**Send coupon—pinned to your company letterhead—  
for your free MTI Plan Kit**

## **CARBOLOY**

DEPARTMENT OF GENERAL ELECTRIC COMPANY

11147 E. 8 Mile Blvd., Detroit 32, Michigan

- ☐ Please rush me, at no cost or obligation, MTI Plan Kit
- ☐ Have your sales representative call to show me the Kit, without obligation
- ☐ Send me the new, free Brief A Log GT 265, containing complete specifications and prices of Standard Carbology Tools and Blanks.

Name  Position

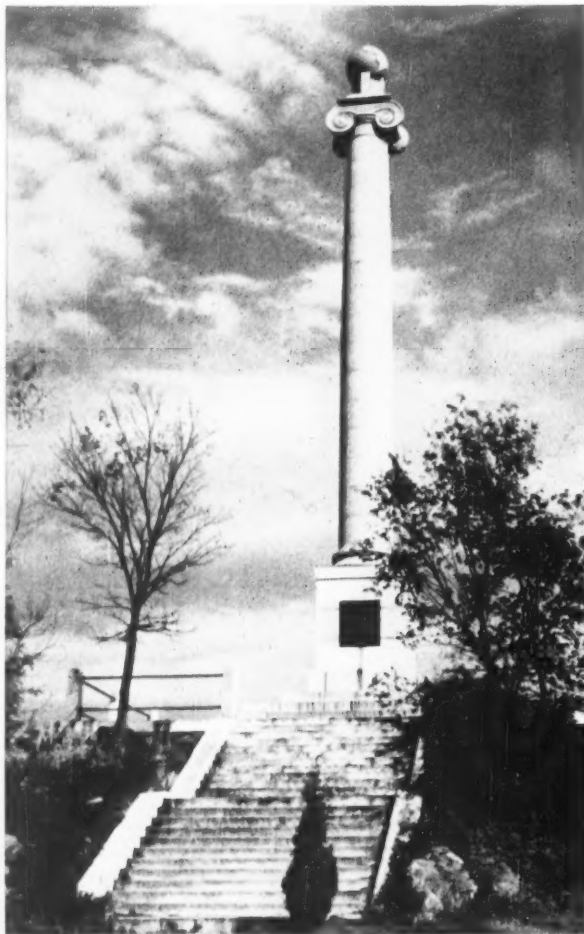
Company

Address

City  Zone  State

# CUMBERLAND GROUND BARS

We manufacture 8" diameter, 7-1/2", 7", 6-1/2", 6", and also odd and intermediate sizes down to and including 1-1/8".

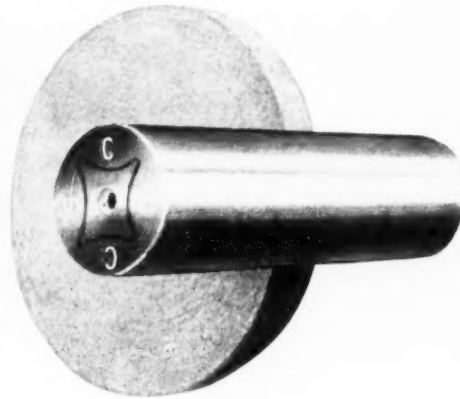


ON THE WEST VIRGINIA SHORE, OVERLOOKING THE POTOMAC RIVER, STANDS THE JAMES RUMSEY MONUMENT

The first practical steamboat in the world was run on the Potomac River a few miles below Cumberland, Maryland.

GEORGE WASHINGTON said in his diary, under date of September 6, 1784: "Remained at Bath all day and was shown the Model of a boat constructed by the ingenious Mr. Rumsey, for ascending rapid currents by mechanism; the principles of this were not only shown, and fully explained to me, but to my very great satisfaction, exhibited in practice in private under the injunction of secrecy—"

At a later date GEORGE WASHINGTON said in his diary: "Spent the afternoon with Mr. Rumsey and then Alexander Hamilton and I rode on to Cumberland, Maryland."



## Symbol of Quality

Approximately 100 years after the exhibit of this steamboat, Cumberland began grinding bars. They found through experience this was the best method by which accurate steel bars could be produced. These bars are so carefully ground that they are adapted for mass production where gears, pulleys, sprockets and bearings must slide on the bars without delay due to filing or fitting.

## IMMEDIATE BARS

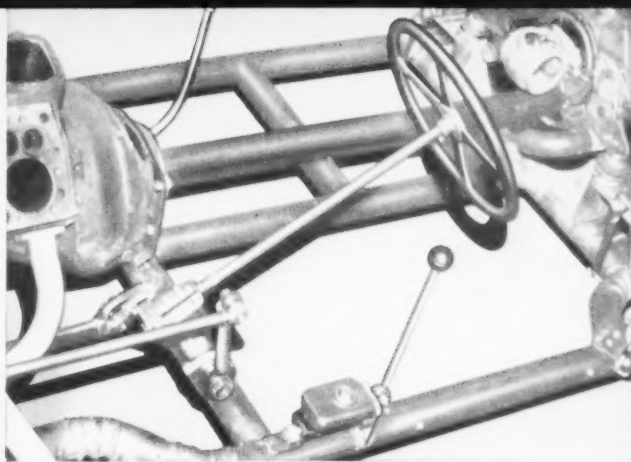
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**CUMBERLAND STEEL COMPANY**

**CUMBERLAND, MARYLAND, U. S. A.**  
ESTABLISHED 1845 INCORPORATED 1892

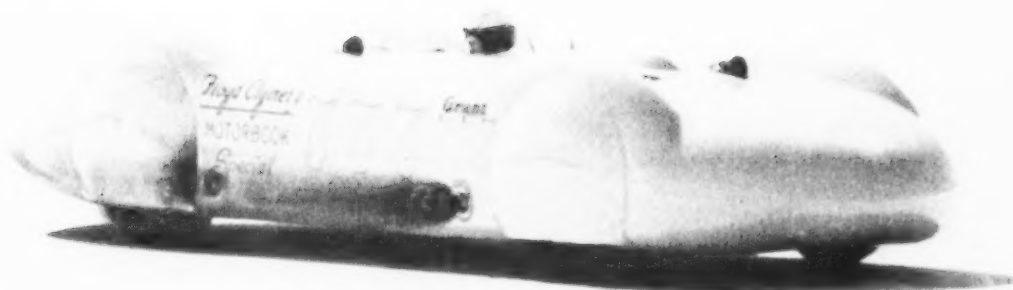
# The frame of **AMERICA'S FASTEST CAR**



This view shows the rugged 2 1/2" diameter Shelby Seamless Tube frame of the twin-engine speedster

## is made of Shelby Seamless Tubing

The Floyd Clymer Motorbook Special, driven by Willie Young, flashes across the Bonneville salt flats, setting the fabulous speed record of 252.10 m.p.h. The car was designed and constructed by Bill Kenz of Denver, Colorado, and sponsored by Motorbook's Publisher, Floyd Clymer.



**252.10 m.p.h.!** The highest speed ever attained by an American automobile. That's the one-way record run of the Motorbook Special last year on Utah's Bonneville salt flats.

To reach this kind of speed and maintain it safely, a combination of power and strength—with lightness—is needed. Two 220 h.p. modified Ford engines supply the power. The frame is fabricated from Shelby Seamless Steel Tubing. Therein lies the strength—maximum strength with minimum weight—that is basic in tubular steel construction. For such requirements, a tube is the strongest structural form you can buy.

Rugged, shock-absorbent Shelby Seamless Tubing combines to the highest degree the factors of strength, safety, and workability. It is uniform throughout, dimensionally accurate, easy to bend and shape. And it possesses excellent machining and superior welding qualities.

Shelby Seamless Mechanical Tubing is produced to exacting standards by the world's largest manufacturer of tubular steel products. It is available in a wide range of diameters, wall thicknesses, and steel analyses. You are welcome to call on our engineers any time. They will be glad to help you apply U.S.S. Shelby to your specifications.



NATIONAL TUBE DIVISION, UNITED STATES STEEL CORPORATION, PITTSBURGH, PA.  
(Tubing Specialties)

COLUMBIA GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS

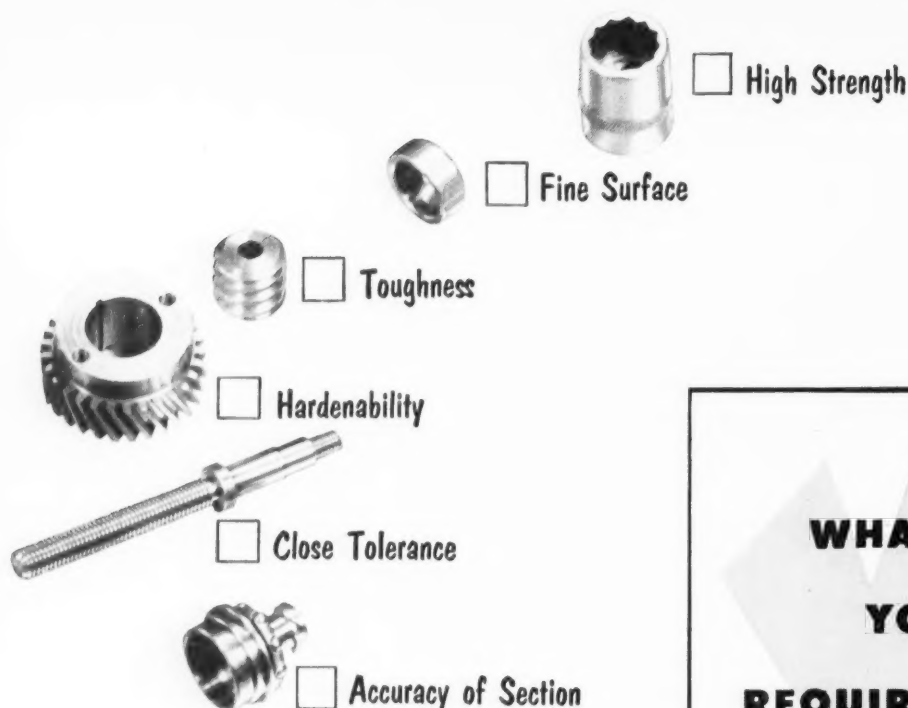
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

### U-S-S SHELBY SEAMLESS MECHANICAL TUBING



UNITED STATES STEEL





**WHAT ARE  
YOUR  
REQUIREMENTS?**

**Republic Cold Drawn Alloy Bars deliver all 6 . . . plus**

### **UNIFORM MACHINABILITY**

Check the properties your steel parts require . . . add the economy of uniform machinability . . . and you have the answer to production and cost problems . . . Republic Cold Drawn Alloy Steel Bars.

High-speed automatics take full advantage of the cost-cutting qualities of Republic Bars. Designers can make full use of the high strength and uniform structure of these cold drawn bars. Production men can get the ideal combination of wearability and strength out of the uniform hardenability and toughness of the alloy steel.

And . . . Republic 3-Dimension Metallurgical Service focuses the experience of our Field, Mill, and Laboratory metallurgists on your production problems for the best answer with Republic Cold Drawn Alloy Steel Bars.

#### **REPUBLIC STEEL CORPORATION**

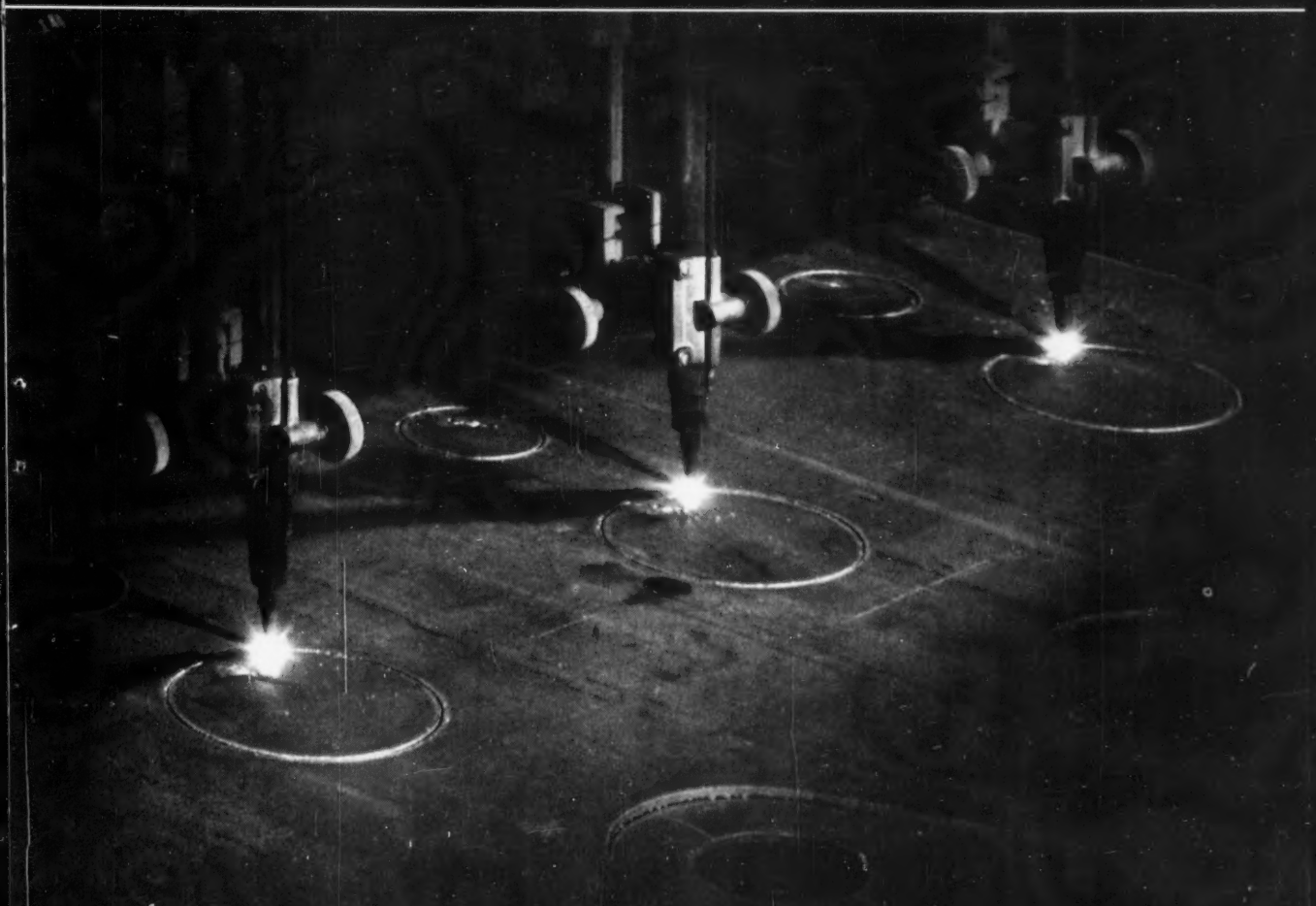
*Alloy Steel Division • Massillon, Ohio*

GENERAL OFFICES • CLEVELAND 1, OHIO  
Export Department: Chrysler Building, New York 17, N.Y.

*Republic* COLD DRAWN  
**ALLOY STEEL BARS**



# WHY IT PAYS TO BUY STEEL FROM WAREHOUSE



**You don't need to invest in expensive  
cutting equipment !**

## WHEN YOU BUY STEEL FROM WAREHOUSE YOU GET:

- LOWER INVENTORY COSTS
- LOWER SPACE COSTS
- LOWER TIME COSTS
- LOWER CAPITAL INVESTMENT
- FASTER PRODUCTION
- FEWER INVENTORY LOSSES

**T**YING up money in large, expensive steel-cutting machinery is something you can avoid, if you wish. Yet you can have your cutting done on the most modern equipment available. When you order your steel from U.S. Steel Supply, specify just how you want it cut. We will meet these specifications exactly. For example, our flame cutting equipment will follow the most complicated patterns without error and turn out finished shapes precisely as you want them. Your U.S. Steel Supply salesman will give you complete information about our cutting services.

## U. S. STEEL SUPPLY

**DIVISION**

*General Office*  
208 So. La Salle St., Chicago 4, Ill.

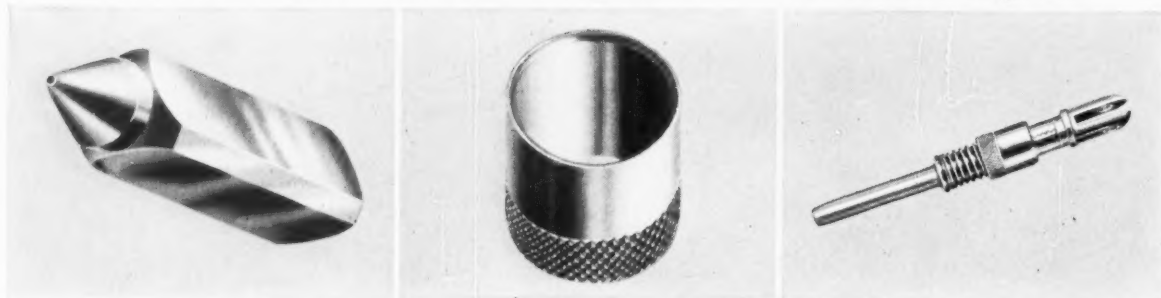


Warehouses and Sales Offices Coast to Coast

UNITED STATES STEEL



**Better Finishes . . . Faster Speeds . . . or Fewer Rejects**



**Reported on Each of These Jobs**



produced from *Carpenter* Free-Machining Stainless

**These are not unusual job records.** The reason for performance records such as 10% faster machining and 5% to 8% fewer rejects is the *constant uniformity* of Carpenter Free-Machining Stainless. Every bar, on shipment after shipment of Carpenter Stainless, responds the same when it meets your cutting tools.

Under today's conditions, it is important that you get every possible finished part from the Stainless Steel you buy. To do that . . . to find new ways to turn Stainless jobs out faster and better . . . make use of the personal shop help your Carpenter

representative can give you. He will be glad to work with you and your men, to make his experience stretch the available supply of Stainless Steel.

Another help Carpenter can give you is useful information about machining Stainless. For example, the Carpenter "NOTEBOOK on Machining Stainless Steels" covers turning, drilling, reaming, lubrication, etc. If you would like a copy, just send us a note on your company letterhead, indicating your title.

The Carpenter Steel Company • 105 W. Bern St. • Reading, Pa.  
Export Department: The Carpenter Steel Co., Port Washington, N. Y.—"CARSTEELCO"



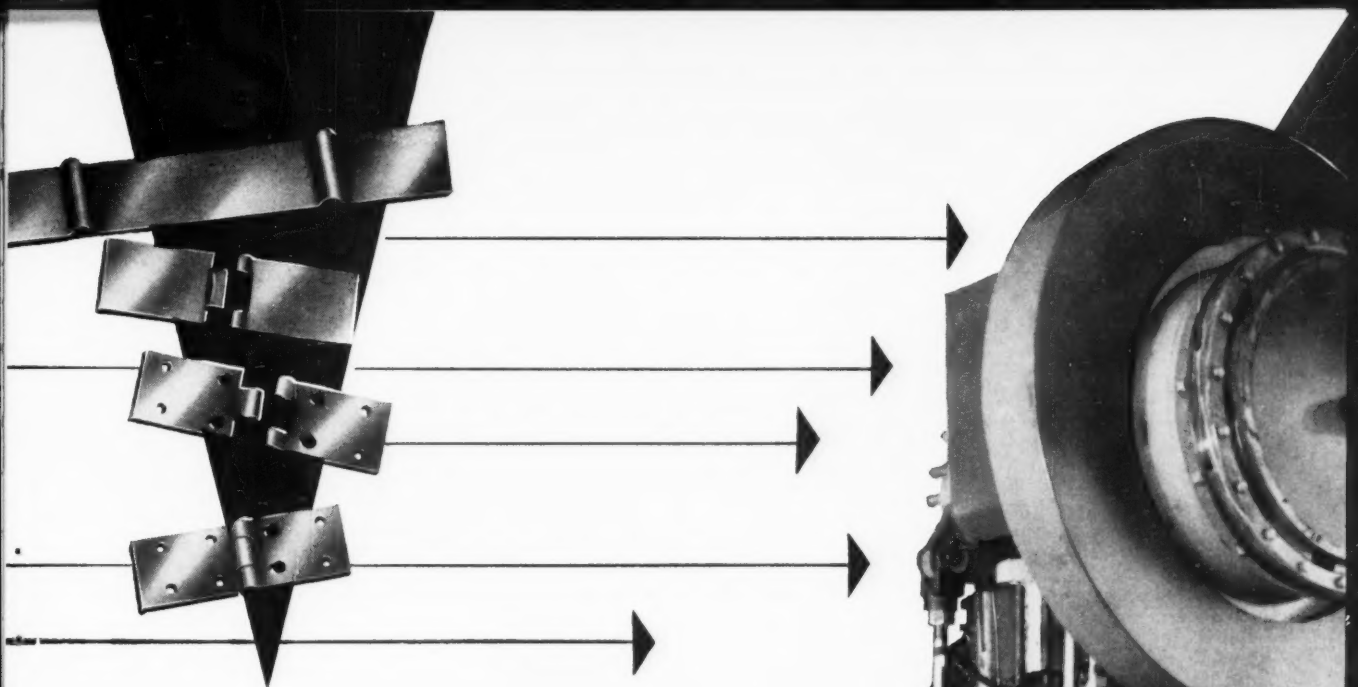
**Carpenter**

**Free-Machining Stainless**

*takes the problems out of production*



Call your nearest Carpenter Mill-Branch Warehouse, Office or Distributor

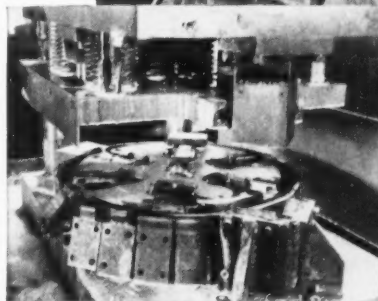


## Profits Hinge on Steady Production?

Here's a heavy-duty job that Clearing O.B.I. presses are taking in stride. The Steel Parts Corp., Tipton, Indiana mass produces automotive door hinges from continuously fed strip. The strip, purchased with regularly spaced lobes, is  $\frac{3}{8}$ " thick,  $\frac{3}{4}$ " thick at the lobe. Both hinge sections are blanked in a single operation. Later operations on Clearing O.B.I. presses form the hinge joint and punch the mounting holes.

Production is continuous except for feeding interruptions. Rough work for an O.B.I.? Just the kind that Clearing presses with their husky all steel welded frames are built for. When profits hinge on steady production, call on Clearing Machine Corporation.

Another Clearing O.B.I. punches mounting holes. In this closeup of the die area, you can see the punched hinge sections.



# CLEARING PRESSES

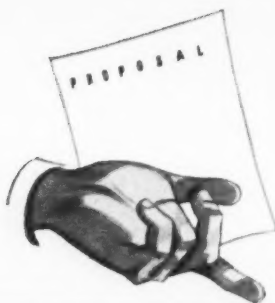
THE WAY TO EFFICIENT MASS PRODUCTION

CLEARING MACHINE CORPORATION, 6497 West 65th St., Chicago 38, Illinois • HAMILTON DIVISION, Hamilton, Ohio

For more information on products advertised, use Inquiry Card, page 239

MACHINERY, September, 1953—105





*Here's another reason  
it pays to get a proposal  
from Fosdick*

## We put a table on the

When Fosdick engineers put a table on the radial, a unique and basic machine tool was born. This machine combines the best features of two proven, reliable designs. It gives you the capacity and flexibility of a radial—the rigidity, compactness and convenience of an upright. It's the machine you need when you want versatility and economy in limited floor space.

The arm of the Sensitive Radial swings 360° on the rigid one-piece column. Controls are always at the same convenient height. Work is placed on the adjustable table, or on the base with the table swung out of the way. Drills up to 1½". 12" column, 3' or 4' arm, nine speeds, four feeds, 3 hp motor, reversing motor control for tapping.

*For full information on the  
Sensitive Radial ask for Bulletin SRM.*

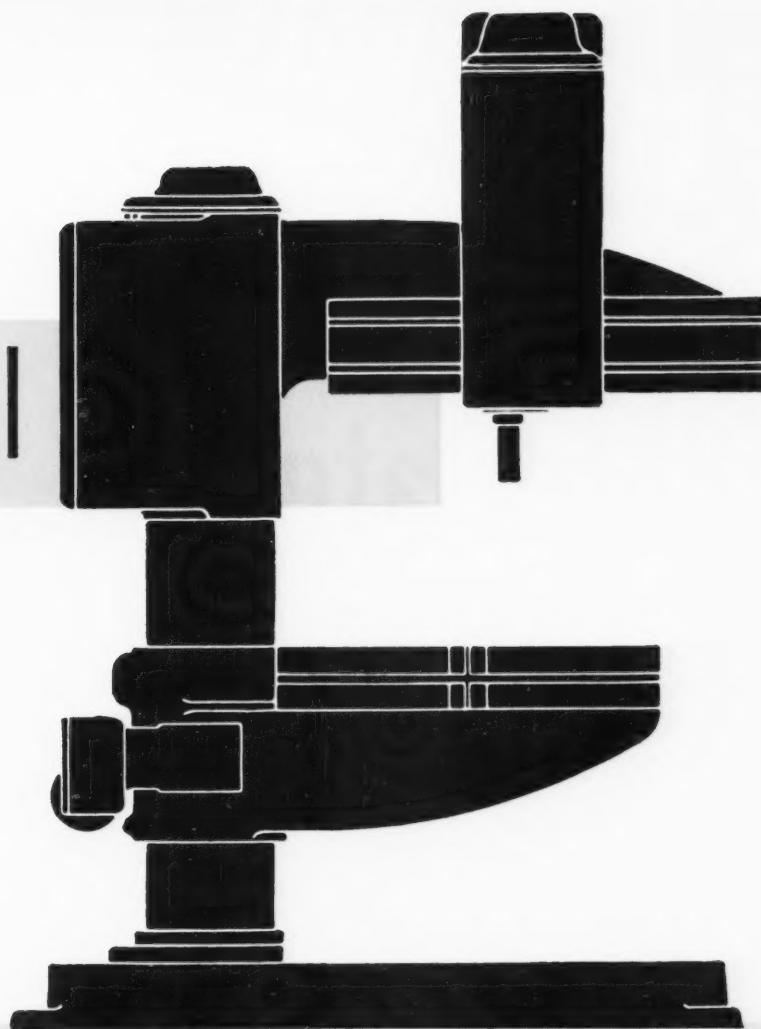


## to give you

### **Variety problem solved at Lodge & Shipley**

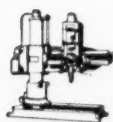
Building 46 lathe models from 14" to 60" requires plenty of production versatility. To drill and tap a broad variety of vari-shaped parts, *Fosdick's proposal* recommended the Sensitive Radial. Now Lodge & Shipley assigns tool blocks, levers, cam plates, spindles and many more complex parts to their Fosdick, knowing it will produce fast and easily. *Operation illustrated:* Tailstock spindle clamped to table vee. Drill, chamfer and tap 4 holes. 17/64" drill, 1020 rpm, .004 ipr, 7/8" deep. Chamfer, 1020 rpm. Tap 5/16" x 18 thread using Automatic Tapping Control (extra equipment), 240 rpm, 1/2" deep.

radial



versatile production like this

*Need Drilling Equipment? Get a Proposal from Fosdick!*



Radial Drills



Jig Borers



Sensitive and  
Upright Drills



Sensitive  
Radial Drills



Automatic Positioning  
Machines

**FOSDICK**

**THE FOSDICK MACHINE TOOL CO., CINCINNATI 23, OHIO**

For more information on products advertised, use Inquiry Card, page 239

MACHINERY, September, 1953—107

**"CINNATI"**

**shears 24 feet of  
1/4 inch plate**

**...straight and true!**

Cincinnati Shears, built with machine tool accuracy and exceptional rigidity, cut to close tolerances even on the longest cuts.

Built in lengths from 4 ft. to 24 ft., they shear .005" thick sheets to 1 1/4 in. plate with micrometer accuracy. They handle a wide variety of materials ranging from soft aluminum to armor plate.



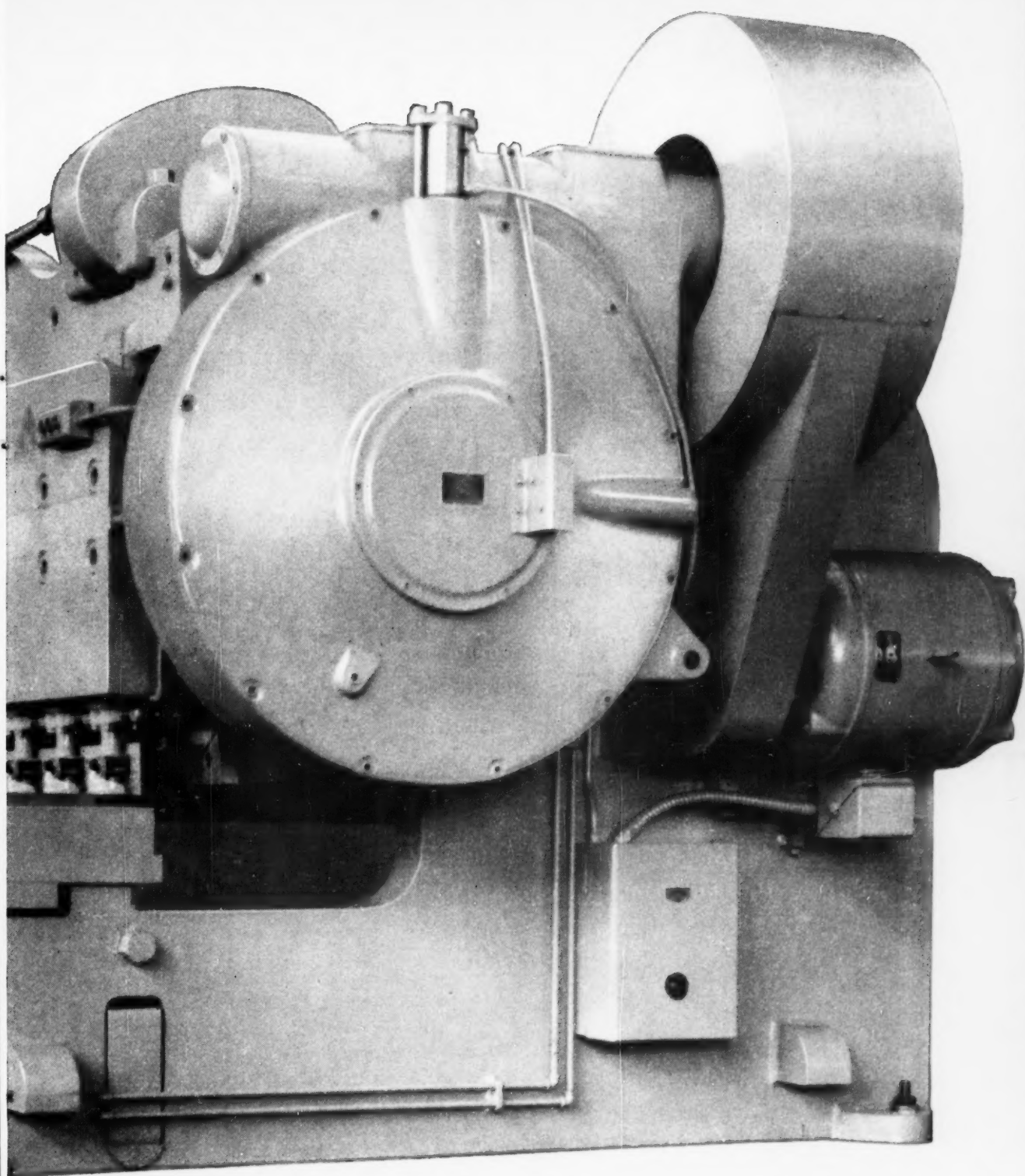
Write for complete shear catalog S-6.



**THE CINCINNATI SHAPER CO.**

CINCINNATI 25, OHIO, U.S.A.

SHAPERS • SHEARS • BRAKES

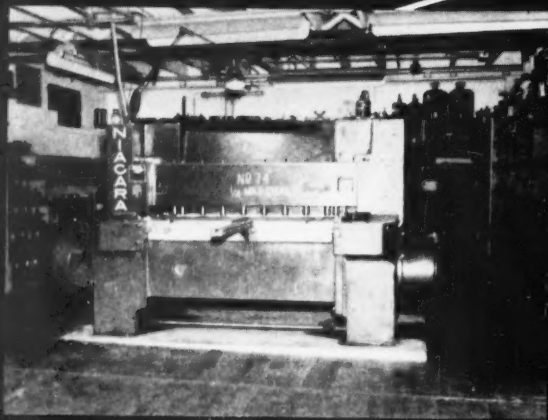
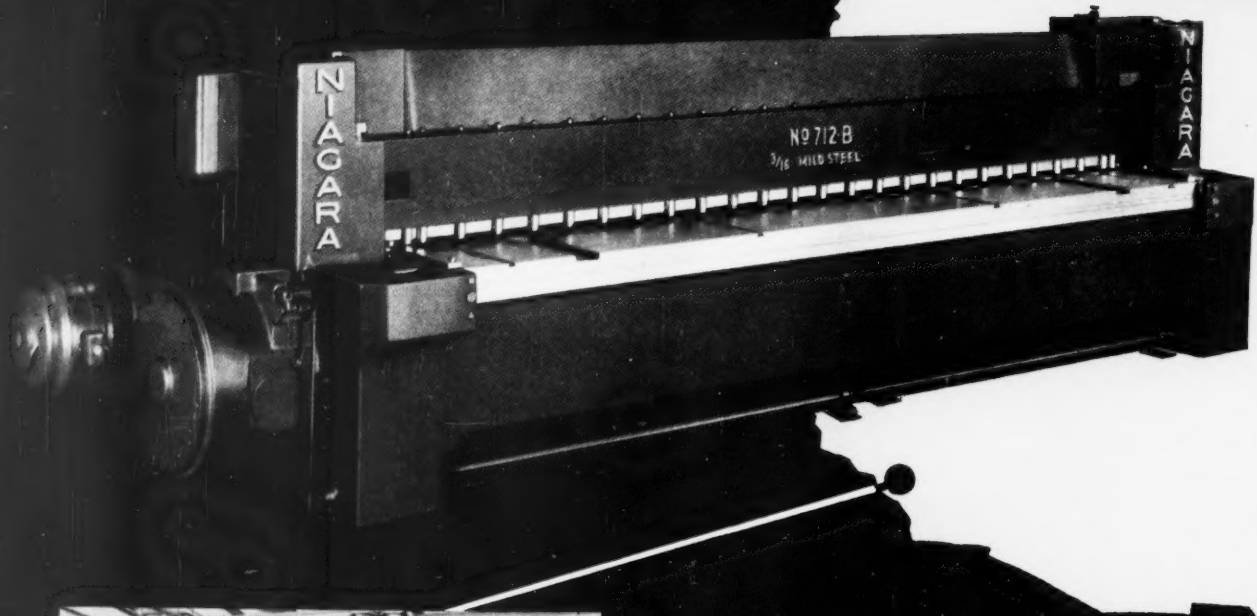


■ Cincinnati 10024 Series Shear capacity  $\frac{1}{4}$  in.  
mild steel 24 ft. long.

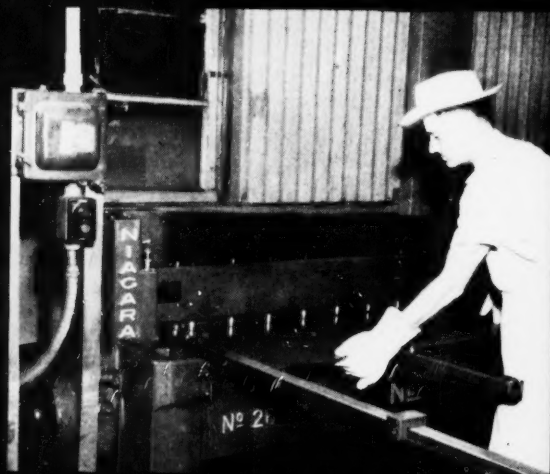


# NIAGARA

SERVE INDUSTRY FROM



**ELECTRONICS.** Cutting .003" molybdenum to within .001" and 1/4" copper with no change in set-up at a plant in California



**DRUMS.** Shearing sheets for drum bodies in Texas

**NIAGARA MACHINE & TOOL WORKS • BUFFALO 11, N. Y.**

# SHEARS

## COAST TO COAST

\* For high volume shearing applications, Niagara shears are preferred because of their:

**DEPENDABILITY /  
ACCURACY  
LOW MAINTENANCE COST**

*A few typical installations are illustrated*

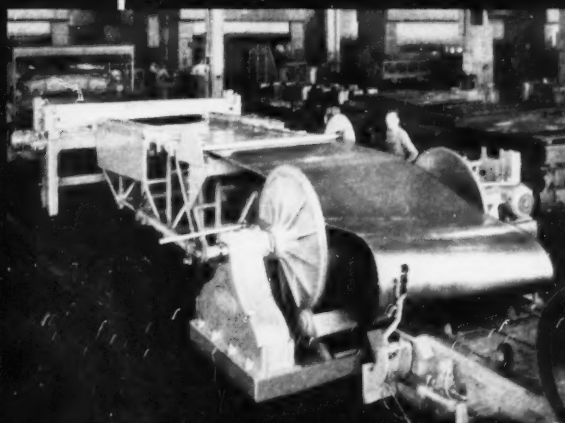
Niagara builds more than 80 different sizes and capacities of squaring shears... one to suit every requirement of production, maintenance or warehousing.



**ELEVATORS.** Two of seven Niagara Shears in production at a large plant in New Jersey



**WAREHOUSE.** Shearing thousands of tons of all kinds of steel at a steel warehouse in Michigan



**AUTOMOBILES.** Continuous operation in a cut off line at a body plant in Western New York

*America's Most Complete Line of Presses, Shears, Machines and Tools for Sheet Metal Work*

**DISTRICT OFFICES: DETROIT • CLEVELAND • NEW YORK • PHILADELPHIA**

*Dealers in principal U. S. cities and major foreign countries*

# YOU CAN CHECK IT FASTER

with Precision Made  
**Jones & Lamson**

## *Comparator Charts*

With these charts many **Difficult Inspection Operations Become Routine Jobs.**

They are **Invaluable Accessories** that **Add** to the **Economy** and **Versatility** of the **Comparator**.

**Top Quality Materials, Expertly Processed,** assure **Uniform Density of Lines** and provide **Maximum Contrast Between Outline And Image.**

**Made To Precision Standards Of Accuracy** established during more than **30 Years Of Specialized Optical Experience.**



Write to Dept. 710 for your copy  
of our Chart Catalog No. 471.

# JONES & LAMSON

JONES & LAMSON MACHINE CO., 512 Clinton St., Dept. 710, Springfield, Vt., U.S.A.

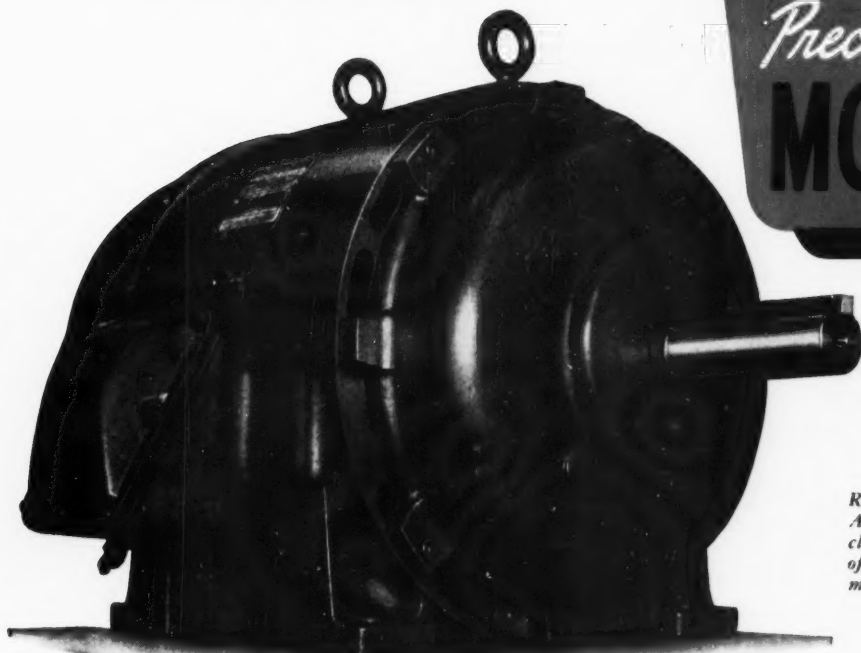


*Machine Tool Craftsmen  
Since 1835*

**OPTICAL COMPARATOR DIV.**

# FOR RUGGED SERVICE...

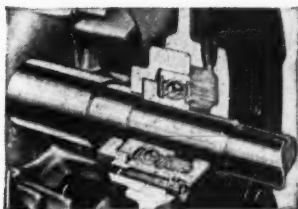
*"All motors are  
NOT alike!"*



**RELIANCE**  
*Precision-Built*  
**MOTORS**

*Reliance Totally-enclosed Fan-cooled A-c. Motor. All other standard enclosures available, with wide choice of mechanical designs and special mountings. Ratings from 3/4 to 300 hp.*

- ☆ Heavy shafts, bearing to bearing
- ☆ Indestructible pressure-cast rotors
- ☆ Shock-resistant frame and bearing-bracket construction



#### ... AND THE BEST PRE-LUBRICATED BEARING DESIGN

The Reliance pre-lubricated bearing provides *four times more operating hours without re-lubrication* than any other bearing used in motors today. And—whatever your lubrication schedule—you just can't grease'em wrong! To get the complete "inside story" on motor bearings, write today for Bulletin B-2201. It contains hard facts on the advantages of the Reliance pre-lubricated bearing design, with cutaway view, cross-section diagram, comparison chart, and statements by bearing manufacturers. B-1459 J

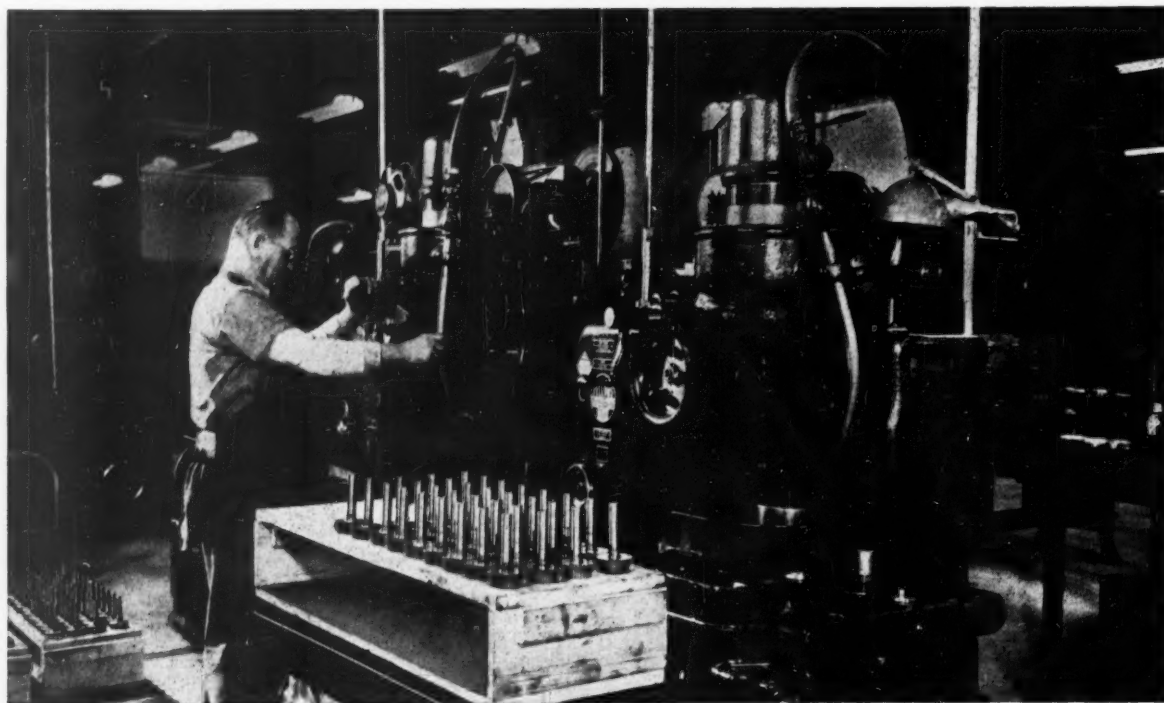
## **RELIANCE** **ELECTRIC AND ENGINEERING CO.**

1077 Ivanhoe Road, Cleveland 10, Ohio • Sales Representatives in Principal Cities



# "No doubt about it... Sinclair saves us money"

... says W. P. St. John, Owner, Radax Manufacturing Co., Rochelle Park, N. J.



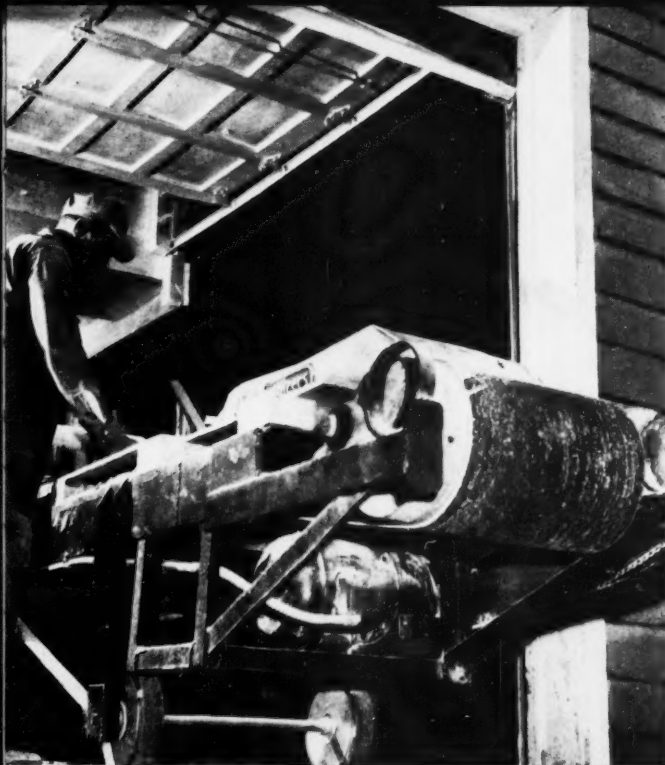
*Sinclair UMBRA making a tough job easier — gear cutting S.A.E. 4340 steel—45 Rockwell*

The Radax Manufacturing Company has a reputation for tackling "tough jobs." As Mr. St. John says, "Our extensive equipment allows us to contract for extreme precision work — work that requires the very finest of cutting oils. We've been using Sinclair RIVALO®, UMBRA® and EMULSICOOL® exclusively for four years. They've enabled us to increase our production, produce better finishes and greatly reduce downtime for tool sharpening. As a result, our unit costs are less. There's no doubt Sinclair cutting oils are saving us money."

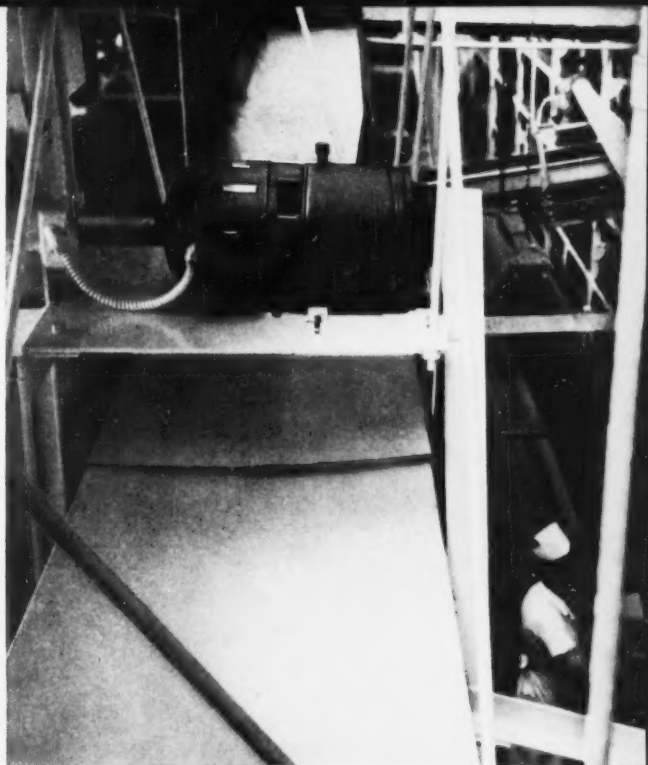
Sinclair cutting oils can help save money for you, too. Why not phone or write the nearest Sinclair Representative or write Sinclair Refining Company, 600 Fifth Avenue, New York 20, N. Y.

## **SINCLAIR CUTTING OILS and COOLANTS**

**...for Metal Working**



**ON THE DRIVEN MACHINE.** Compact, single-unit G-E Tri-Clad\* Gear-motors—available in all three AGMA gear classes—are easily installed on machines such as the conveyor in this chemical plant.



**UP OUT OF THE WAY** is where this eastern bakery installed a G-E Gear-motor on its cooling conveyor. Gear-motor operates 56 hours per week—no maintenance has been required since installation.

## You can install G-E Gear-motors anywhere

... on or under the floor, on the ceiling, the wall, or even outdoors in the weather. Installation is no problem with G-E Tri-Clad Gear-motors ... there are no bulky external couplings, chains, or belts between the motor and the speed-reduction unit. G-E Tri-Clad Gear-motors are packaged, single units ... complete in themselves ... as easily and as quickly installed as any constant-speed motor of the same rating.

**G-E GEAR-MOTORS SAVE YOU SPACE.** Their compact, well-balanced design frees valuable floor space for productive purposes.

**G-E GEAR-MOTORS ARE ECONOMICAL.** Initial costs are often lower than either a low-speed motor or the combination of a normal speed motor and a separate speed reducer. High efficiency up to 98.5% minimizes operating expenses.

Assure your application of the most compact and economical low-speed drive ... one which can be installed anywhere. Order your G-E Tri-Clad Gear-motor through your nearest G-E Apparatus Sales Office or your Authorized G-E Agent or Distributor. For more information write to Section 755-13, General Electric Co., Schenectady 5, N. Y. for your free copy of Bulletin GEA-1437H.

\*Reg. Trademark of General Electric Company.

**OUTDOORS IN THE WEATHER.** This 5-hp totally enclosed G-E Tri-Clad Gear-motor—exposed to all weather conditions—drives a sand screening operation in a carbon and graphite products plant.



*You can put your confidence in—*

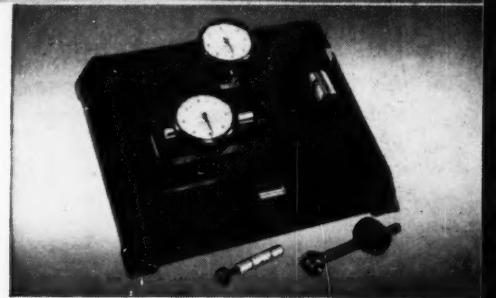
**GENERAL  ELECTRIC**

*When your jobs*



**COMPLETE SET OF GAGES  
ENGINEERED BY FEDERAL FOR INSPECTING  
THE WORKING PARTS OF AN AUTOMOBILE  
SUB-ASSEMBLY . . .**

Photo shows Gages for use at production and at final inspection. All these Gages were engineered directly from customer's Process Sheets and were designed from the sample parts shown and from blue-prints. Each Gage checks a different dimension and is shown with its *single* master (*not two*).



ALIGNMENT of TWO HOLES in compressor connecting rod is checked to a high degree of accuracy. Model 256 B-37.

*"Gaging for Profit"*

Full Color with Sound Film available upon request. Write for reservation.



# *reach Process Engineering*

CALL FEDERAL IN

FOR GAGE ENGINEERING!

WHEN YOU START TO PROCESS YOUR JOBS, that's the time to take advantage of our years of experience in designing every sort of dimensional visual gage. Our engineers know how to set up your gaging requirements and save you time and money.

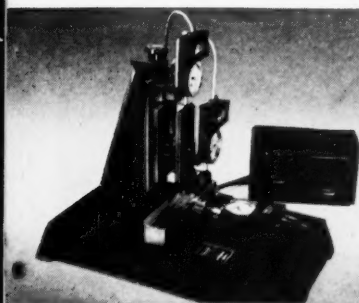
At Federal we know the basic difference between designing and building precision gages and designing other mechanical products.

Designing machines, fixtures and tools involves holding workpieces in position by force – transferring and transforming power to act as wanted – counteracting heavy stresses and strains.

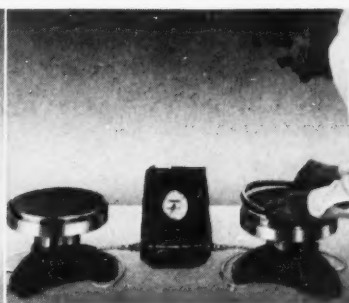
Designing precision gages, however, requires knowledge of how to *magnify* and *transfer* measurement variations *precisely*, without *loss* of motion – with a minimum of *friction* and *inertia* in the working parts – and a hundred other details which do not concern the usual tool and machine designer.

Use Federal's highly specialized experience and obtain the benefit of our extensive know-how and skill. No matter whether it's an Air or Automatic Gage or a Dial Indicator type, there is every reason you should get better gages if Federal designs and builds them. Call in Federal when you *start* processing a job and let us engineer your gages for you. Federal Products Corp., 1119 Eddy Street, Providence 1, Rhode Island.

## A FEW OF THOUSANDS OF INDIVIDUAL GAGES ENGINEERED BY FEDERAL



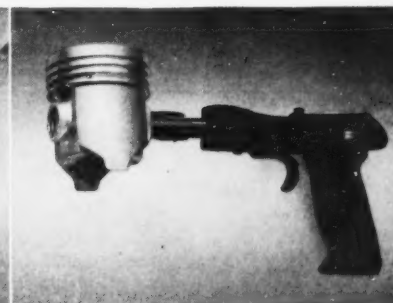
THICKNESS, WIDTH and TAPER are checked simultaneously. Tolerance lights show if a dimension is incorrect. Model 325 B-57.



AVERAGE INSIDE DIAMETER of thin rings checked with 6-jet Air Gage. Special Guide Sleeve makes rings slip on gage easily. Model APH-S-9.



SPACING between blades of turbine is checked at two points. Model 294 P-167.



DISTANCE between retaining ring grooves in wrist pin holes of piston checked for accuracy. Model 444 P-226.



# FEDERAL

LARGEST MANUFACTURER DEVOTED EXCLUSIVELY TO DESIGNING AND MANUFACTURING ALL TYPES OF DIMENSIONAL INDICATING GAGES



# GRITCLOTH

OPEN MESH SANDING FABRIC

**REVOLUTIONARY DISCOVERY...  
"HEARD 'ROUND THE WORLD!"**

PATENT  
APPLIED  
FOR

The world-wide demand for our latest abrasive development, GRITCLOTH, has already forced us to increase our production capacity. Right now we are keeping abreast of the still growing clamor for this most advanced sanding material. GRITCLOTH gives the removed particles a place to go and thereby maintains fast cutting action throughout its amazingly long life. For machine and hand sanding or polishing . . . wet or dry . . . it's GRITCLOTH. Order now!



Excellent for fast, smooth rubbing of prime coats on all boat and marine finishes. Extra-long life whether you use GRITCLOTH wet or dry.



New production speeds in all metal fabrication finishing and deburring. Less down-time means more production and less cost with GRITCLOTH.



Outstanding results from leading car manufacturers using GRITCLOTH for wet prime-coat sanding. BOTH SIDES OF GRITCLOTH are used, for maximum life.



Non-loading feature gives GRITCLOTH tremendous advantages in speed and amount of material removed. GRITCLOTH saves you money on machine or hand polishing.

★ 10 to 15 TIMES LONGER LIFE than the conventional types of coated abrasives.

★ APPLICATIONS ARE LIMITLESS . . . each day finds a new successful operation for this Miracle Modern Sanding Fabric.

Where  
can you  
use it?

★ NON-LOADING... OPEN MESH LETS THE REMOVED PARTICLES FLOW RIGHT THROUGH.

★ THOUSANDS OF SUPER-SHARP EDGES KEEP ON CUTTING.

★ USE WET OR DRY

★ FLAT OR FOLDED

★ BY MACHINE OR HAND

★ BOTH SIDES



**GRITCLOTH...**  
a BAY STATE  
Pioneered  
Product

**BAY  
STATE**

**BAY STATE ABRASIVE PRODUCTS CO., Westboro, Mass., U. S. A.**  
Branch Offices and Warehouses — Chicago, Cleveland, Detroit, Pittsburgh  
Distributors — All principal cities  
In Canada: Bay State Abrasive Products Co. (Canada) Ltd., Brantford, Ont.

*"STANDARD for  
tough jobs since 1881"*



*Red Shield says:*

Call your Industrial Supply Distributor for Shield Brand Twist Drills.

Specialized factory service available everywhere.

**STANDARD TOOL Co.**

3950 CHESTER AVENUE CLEVELAND 14, OHIO



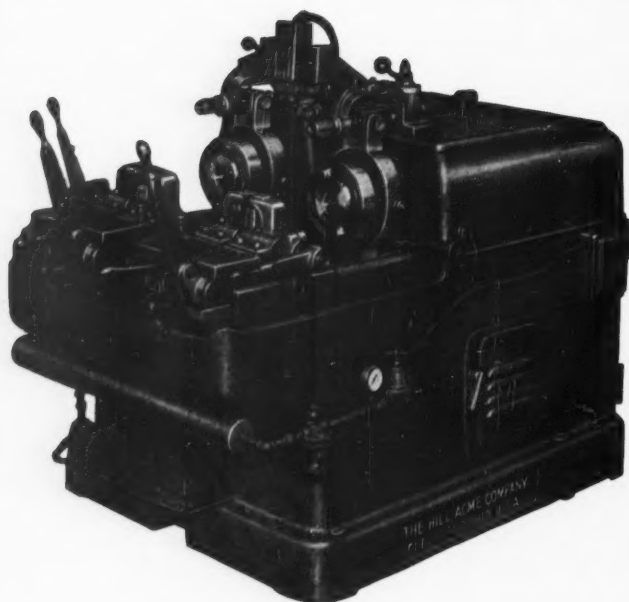
NEW YORK • DETROIT • CHICAGO • DALLAS • SAN FRANCISCO

THE STANDARD LINE: *Twist Drills • Reamers • Taps • Dies • Milling Cutters • End Mills • Hobs • Counterbores • Special Tools*

# Another **FIRST**

## FOR **ACME XL THREADING MACHINES**

*Air operated Head  
now available...*

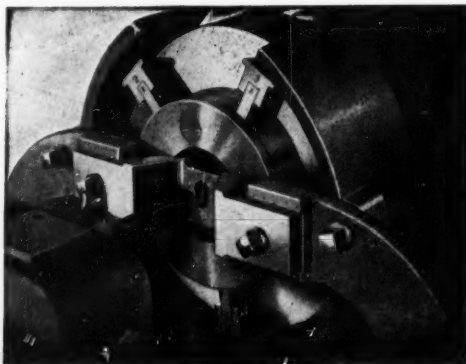


Acme Model XL Threading Machines can be equipped with a semi-automatic, air-operated head-opening and closing mechanism for rapid lock and release of dies to provide greater accuracy of thread length and reduce operator fatigue. A bleeder valve adjustment provides variable speed to this head tripping mechanism. Forward and return movement of the carriage effects the opening and closing of the die head.

This new device is an exclusive feature of ACME Model XL Threading Machines and is adaptable to both single and double spindle machines in the complete range of sizes offered.

### **ACME HOB TYPE 5 DIE HEAD**

The problem of threading rectangular stock with an interrupted cut, is solved by the ACME HOB TYPE 5 die head. This special head insures three chasers always being in contact with the work. With the five die head illustrated, a guide is provided to compensate for the torque developed when threading rectangular stock. This adaptation of ACME Threading Equipment to difficult jobs, illustrates why the large percentage of pipe wrench manufacturers are using ACME Threading Machines today, replacing the obsolete thread milling method.



## **THE HILL ACME COMPANY**

**ACME MACHINERY DIVISION • 1203 W. 65th St., Cleveland 2, Ohio**  
ESTABLISHED 1882

**"ACME" FORGING • THREADING • TAPPING MACHINES • ALSO MANUFACTURERS OF "HILL" GRINDING AND POLISHING MACHINES  
HYDRAULIC SURFACE GRINDERS • "CANTON" ALLIGATOR SHEARS • PORTABLE FLOOR CRANES • "CLEVELAND" KNIVES • SHEAR BLADES**

# NEW! A PRACTICAL SHOP TOOL FOR MEASURING SURFACE ROUGHNESS



## THE BRUSH SURFINDICATOR\*



WITH this instrument, you can *specify* surface roughness in average microinches on the blueprint—*measure* surface roughness quickly in the shop.

*Developed by General Motors Research Laboratories Division.  
Manufactured under patent license from General Motors Corporation.*

EASY-TO-USE • PORTABLE • ACCURATE

BRUSH ELECTRONICS

INDUSTRIAL AND RESEARCH INSTRUMENTS  
PIEZOELECTRIC MATERIALS • ACOUSTIC DEVICES  
MAGNETIC RECORDING EQUIPMENT  
ULTRASONIC EQUIPMENT



COMPANY

*formerly  
The Brush Development Co.  
Brush Electronics Company  
is an operating unit of  
Clevite Corporation.*

\*Trade Mark





## SURFINDICATOR

*helps you meet surface finish specifications exactly*

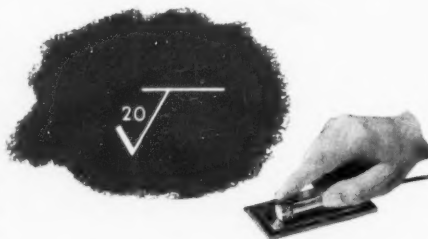
With this new, portable inspection tool, you can make surface roughness measurements on the production line. The operator merely guides the pickup over the piece to be inspected, and then reads surface roughness in average microinches on the meter. This permits you to specify surface roughness in the design and then to measure it in the shop.

The SURFINDICATOR is always reliable because the unit

is equipped with precision reference specimens. These permit checking accuracy of the instrument at any time, and provide a set of standards for absolute calibration. Using SURFINDICATORS, several plants in different locations can produce parts to the same surface roughness specifications. Here is the instrument that makes surface roughness measurement a practical shop operation. Get the complete story on the BRUSH SURFINDICATOR now!



**PORTABLE**... Weighs only 15 pounds and can be set up anywhere in the plant where 60-cycle, 115 volts a.c. is available. Completely self-contained.



**ACCURATE**... Precision reference specimens permit calibration to an absolute standard and enable you to check accuracy of instrument at any time.

**AVOID DELAY**—enter your order now!

Thorough field testing of the SURFINDICATOR has now been completed. If you wish to reduce costly rejects and improve your surface finish control, we urge you to place your order quickly, either through your nearest Brush representative or with the coupon below.

Price of the SURFINDICATOR is only \$685 f.o.b., Cleveland...far less than other types of surface measurement instruments. The SURFINDICATOR is a *shop tool*—requires no installation; shipped completely packaged; ready to put to work

**Brush Electronics Company, Dept. Y-9**  
3405 Perkins Avenue • Cleveland 14, Ohio

☐ Please enter our order herewith for Model BL-110 SURFINDICATORS, at \$685.00 each, f.o.b., Cleveland.

☐ Purchase order is attached.

☐ Please send additional information on the SURFINDICATOR.

Name.....

Company.....

Your position.....

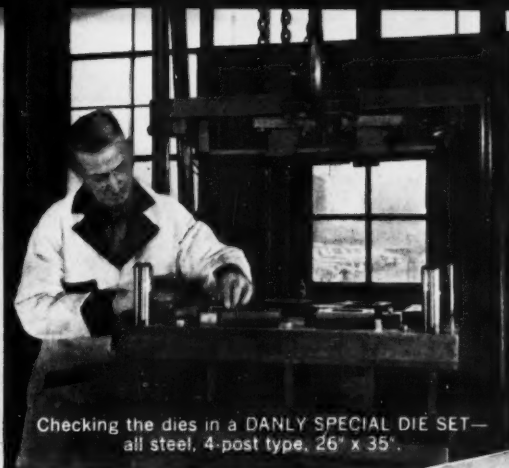
Address.....

City..... State.....

### Specifications of SURFINDICATOR

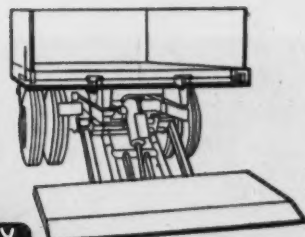
|                               |   |
|-------------------------------|---|
| Roughness range . . . . .     | 1 to 1,000 microinches                                      |
| Range scales . . . . .        | 0-10, 30, 100, 300 and 1,000 arithmetic average microinches |
| Cutoff wave lengths . . . . . | .003, .010, .030-inch                                       |
| Warmup time . . . . .         | 3 minutes   |
| Power required . . . . .      | 115 volts, 60 cycles, a.c.                                  |
| Dimensions . . . . .          | 10 1/4" x 9" x 8 1/4"                                       |
| Net weight . . . . .          | 15 lbs.   |
| Shipping weight . . . . .     | 18 lbs.   |
| Model . . . . .               | BL-110 Surfindicator  |

(Includes Amplifier, Pickup and Precision Reference Specimens)



Checking the dies in a DANLY SPECIAL DIE SET—  
all steel, 4-post type, 26" x 35".

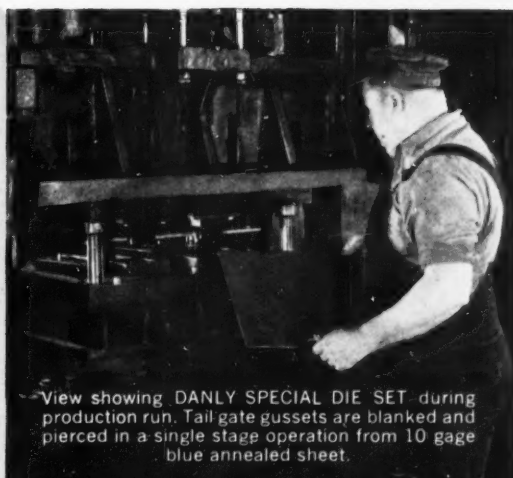
**ANTHONY**  
**LIFT GATE**  
HYDRAULIC



SHOWN IN LOADING POSITION



## ***DANLY SPECIAL DIE SETS***



View showing DANLY SPECIAL DIE SET during  
production run. Tail gate gussets are blanked and  
pierced in a single stage operation from 10 gage  
blue annealed sheet.



**DIE SETS . . . STANDARD OR SPECIAL  
DIEMAKERS SUPPLIES**

## **help Anthony give industry a lift !**

For years now, the Anthony Company, makers of hydraulic lift gates for motor trucks, has relied on Danly Special Die Sets in their production operation. Based on long experience, they've found that Danly Special Die Sets cut their tooling costs and save time . . . because they provide the finest precision starting point for diemaking. Why not build your production dies in Danly Special Die Sets? . . . see what die performance can really mean.

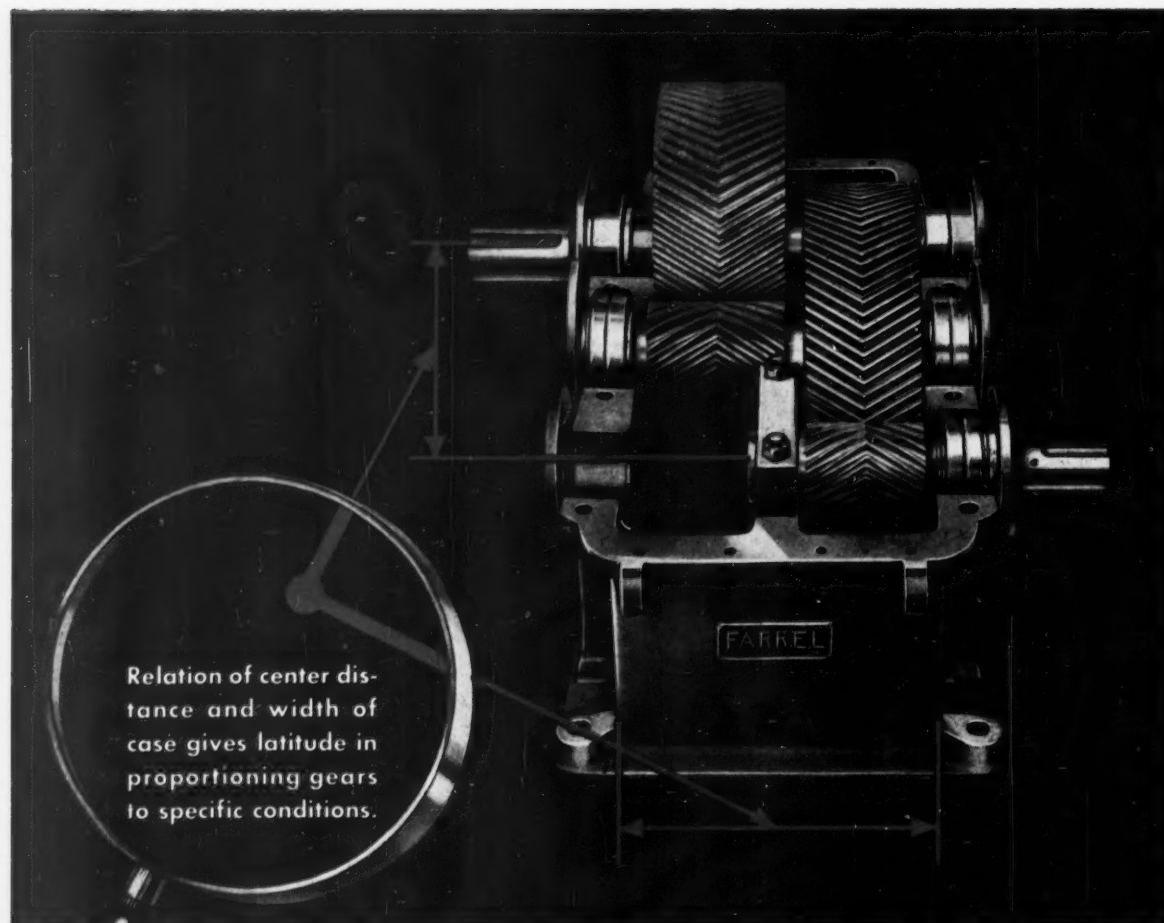
### **DANLY MACHINE SPECIALTIES, INC.**

2100 South Laramie Avenue, Chicago 50, Illinois

**DANLY SPECIAL DIE SET SERVICE  
IS FAST AND CONVENIENT—CALL  
YOUR NEAREST DANLY BRANCH**

|                     |   |
|---------------------|---|
| *CHICAGO 50         | 2100 South Laramie Avenue                           |
| *CLEVELAND 14       | 1550 East 33rd Street                               |
| *DAYTON 7           | 3196 Delphos Avenue                                 |
| *DETROIT 16         | 1549 Temple Avenue                                  |
| *GRAND RAPIDS       | 113 Michigan Street N.W.                            |
| INDIANAPOLIS 4      | 5 West 10th Street                                  |
| *LONG ISLAND CITY 1 | 47-28 37th Street                                   |
| *LOS ANGELES 54     | Ducommun Metals & Supply Co.,<br>4890 South Alameda |
| MILWAUKEE 2         | 111 East Wisconsin Avenue                           |
| *PHILADELPHIA 40    | 511 W. Courtland Street                             |
| *ROCHESTER 6        | 33 Rutter Street                                    |

\*Indicates complete stock



## Take a closer look at why Farrel® speed reducers can solve your drive problems

Unlike most "standardized" products, Farrel speed reducers are standard only in their principal features. They are adaptable in critical detail.

The gears and pinions can be proportioned to meet specific load, speed and service requirements. Input and output shafts can be varied in size, in material, and in extension. Even some housing dimensions can be modified to meet problems in mounting.

This design flexibility has resulted in the solution of innumerable application prob-

lems. There is no need to compromise. You can ask for—and get—a unit that will meet your exact needs.

Then, too, Farrel speed reducers are made in a number of different types, with a wide range of ratios and capacities. Designs include single, double and multiple reduction units, speed change units having two or more selective speeds, right angle drives, and drives to meet special requirements.

*Write for further details of these problem-solving units. Ask for a copy of Bulletin 449.*

### **FARREL-BIRMINGHAM COMPANY, INC. ANSONIA, CONNECTICUT**

*Plants: Ansonia and Derby, Conn., Buffalo, N. Y.*

*Sales Offices: Ansonia, Buffalo, New York, Boston, Pittsburgh, Akron, Detroit, Chicago, Memphis, Minneapolis, Portland (Oregon), Los Angeles, Salt Lake City, Tulsa, Houston, New Orleans*

# *Farrel-Birmingham®*



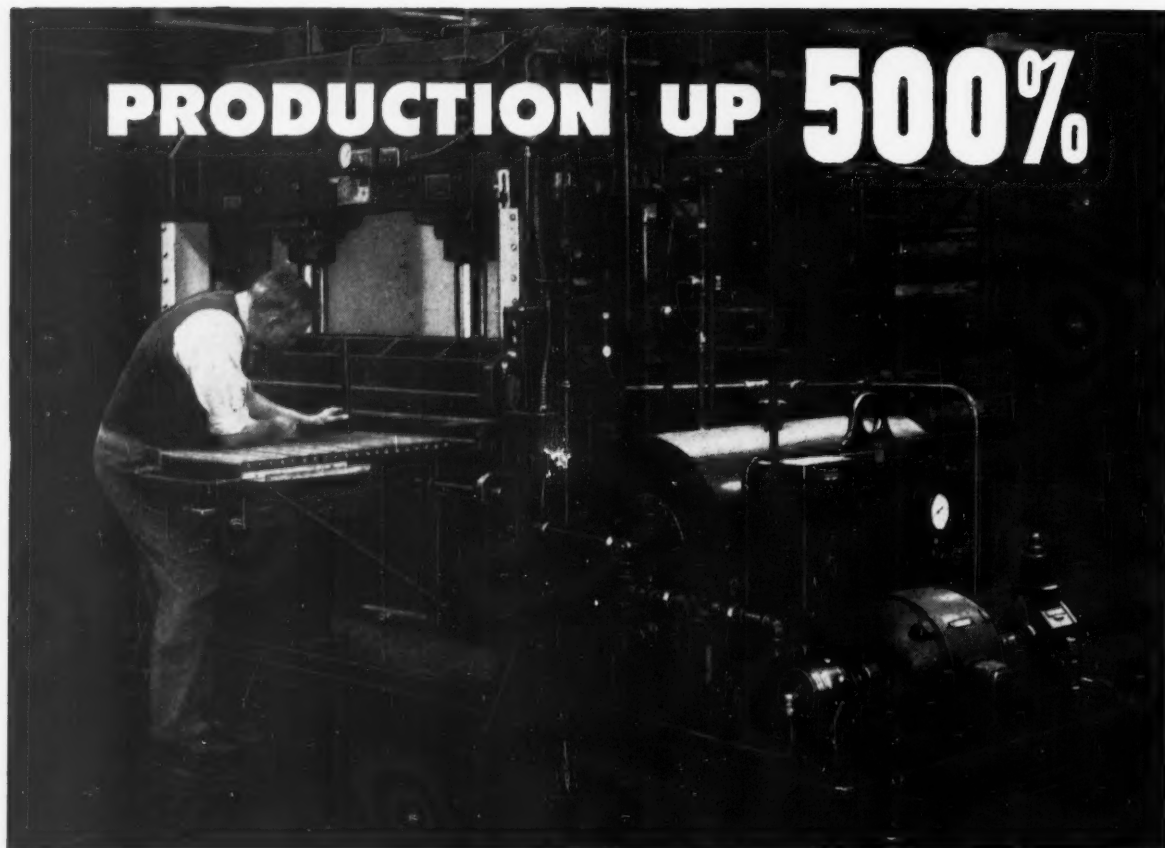
Don't let  
light bulky  
work tie-up  
big-ton presses!

Ram Area 24" x 8½"  
Shut Height 10"  
with 6" stroke  
Throat Depth 11½"  
Bolster Area 21" x 33"

FEDERAL  
PRESS CO  
ELMHART, ILL.

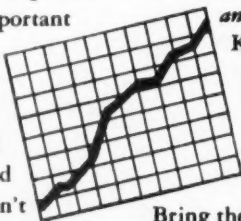


# PRODUCTION UP 500%



## KRW HYDRAULIC PRESS UPS ASSEMBLY OUTPUT 500% AT HOPE'S WINDOWS INC.

The KRW press shown above is curing a big headache! Originally, because of the precise nature of the work, one of the most important assembly jobs at Hope's Windows, Inc., Jamestown, N. Y., was a hand operation. It was slow, painstaking work and held up production of completed Hope's windows. Then the company tried the job on a mechanical press. This didn't work out because the stroke was much too long and, of course, could not be adjusted. Finally, Hope's found the perfect answer to their problem in this 60 ton, 2 cylinder KRW Hydraulic Press.



They set the stroke to  $1\frac{1}{2}$ " — just what they needed. Result? *Every assembly job is perfect and production has increased five-fold.* The KRW Press cost  $\frac{2}{3}$  less than the mechanical press that would do the same job — AND the KRW Press can be used extensively for other production jobs through a simple stroke adjustment! Any pressing problems in your work? Bring them to K. R. Wilson for fast, low-cost solution. One, two and three cylinder models; 25 to 150 ton capacities; hand operated, air operated or motor driven. Or, if you need a custom-designed press, we'll build it for you.

Maximum size Bed and Platen on 100 and 125 ton models—40" x 60"; on 150 ton models—36" x 60".  
For facts, prices and delivery dates see your Machinery dealer or write, wire or phone Dep't. 15



# K • R • WILSON

215 MAIN STREET • BUFFALO 3, N. Y.

# We've put a new roof over an old part of our business

► **Now—with new, expanded facilities—we can offer you immediate help with your unusual metalworking problems, big or small**

**T**HOUGH we've been designing and building standard and special machine tools and tooling since 1898, limited production facilities for special machines have prevented us from offering these services on a wide scale.

But now, our Special Machinery Division has new and greatly expanded facilities. Its exclusive job will be to build special machine tools and tooling or to specially adapt standard equipment to solve specific metalworking problems.

## Check our qualifications:

**EXPERIENCE:** We've been in the business 55 years. In addition to being one of the country's leading producers of standard milling machines . . . *our annual production of special machinery has ranged up to \$3,000,000.*

**FACILITIES:** The new Special Machinery Division plant, built on a 38-acre site, is equipped with more than \$2,500,000 worth of new tools and equipment.

**PERSONNEL:** The Special Machinery Division engineering section has nearly 100 experienced design and production engineers at its command. These men specialize in applying the latest developments in mechanics, hydraulics, electronics, metallurgy and allied fields to metalworking. In addition, it has a full complement of experienced machinists and mechanics needed for special machine construction.

**PERFORMANCE:** Kearney & Trecker's Special Machinery Division is best recommended by its record of successfully solving hundreds of unusual machining problems. These solutions required provision of high productive capacity as well as exacting dimensional accuracies and surface finishes.

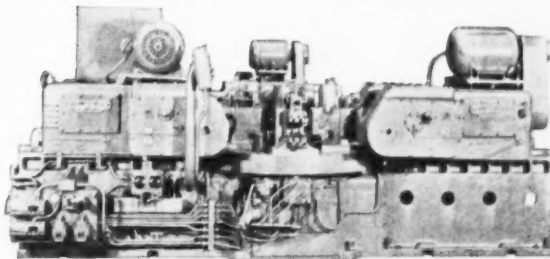
**RESPONSIBILITY:** Our Special Machinery Division is an integral part of the Kearney & Trecker Corporation . . . and is fully supported by all its financial, physical and personnel resources.

Any commitment for a product of this Division is a commitment that fully involves the accepted reputation for responsibility and satisfaction that is Kearney & Trecker's.

## We invite your inquiry

We'll be glad to provide you with any information we can . . . including sample machine specification sheets on typical installations, a brochure covering the expanded facilities of our Special Machinery Division, and details on our Customer Engineering Service. Furthermore, if you have special production machinery problems, have one of our senior Project Engineers analyze them, without obligation, of course.

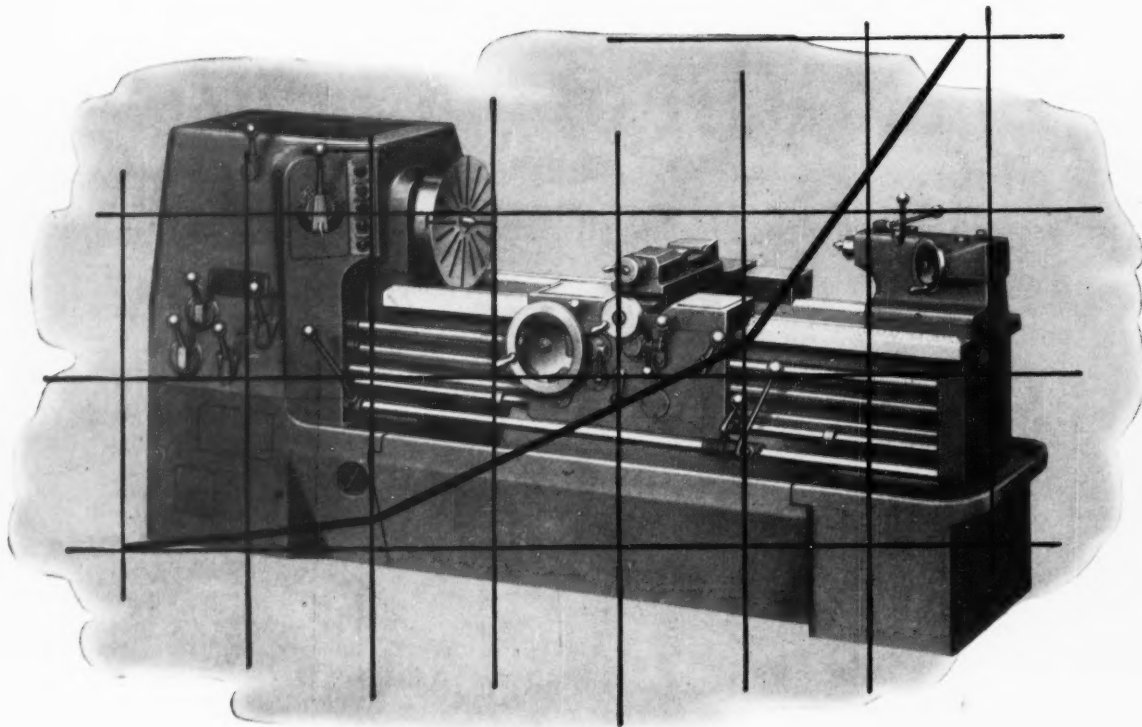
Write, wire or phone the Special Machinery Division, Kearney & Trecker Corp., 6784 W. National Ave., Milwaukee 14, Wisconsin.



We've built special machines or adaptations of standard equipment for practically every industry. Here is a photo of a four-station rotary indexing machine we designed and built for a major automotive manufacturer.



HAVE YOU CHECKED *Your* PRODUCT'S **EQ\*** LATELY?



MAYBE ITS **\*EFFICIENCY QUOTIENT** NEEDS THE LIFT  
AETNA ANTI-FRICTION PRODUCTS CAN GIVE

Throughout industry you'll find Aetna precision bearings and parts improving the efficiency and serviceability of today's products and the machines that make them . . . and contributing to the developments of tomorrow.

As a result of Aetna's faculty of solving the sort of anti-friction problems that "couldn't be solved" manufacturers have often realized startling economies or licked tough merchandising problems that stymied sales.

Tell us about YOUR "tough" bearing or parts problems. It's a pretty certain bet that our engineers will be ready with the right answers—at the right prices—for our vast pool of tools and dies, acquired in creating more than 2000 "specials" for industry, usually enables us to meet unique requirements without the expense of new tooling. Just state your problem, send your prints or ask that a nearby representative drop in. No obligation.



Standard and Special Ball Thrust Bearings • Angular Contact Ball Bearings • Special Roller Bearings • Ball Retainers • Hardened and Ground Washers • Sleeves • Bushings • Miscellaneous Precision Parts.

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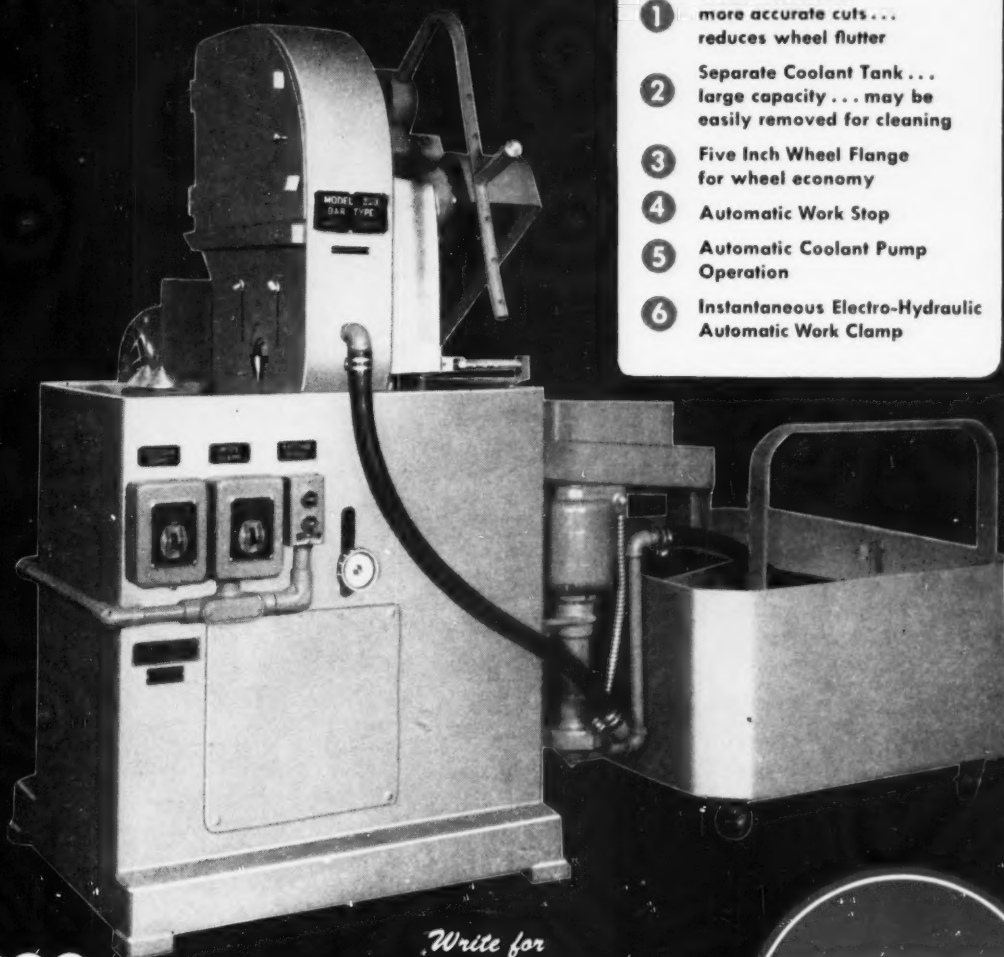
**ACCO**  
products

## CAMPBELL Abrasive Cutters

*New... Low Cost*

### No. 223 Wet Abrasive Cutting Machine

*Fast, clean, close tolerance cuts  
of hardest alloys and all other metals.  
Won't work-harden material.*



#### FEATURES

- 1 Wheel Guides for more accurate cuts... reduces wheel flutter
- 2 Separate Coolant Tank... large capacity... may be easily removed for cleaning
- 3 Five Inch Wheel Flange for wheel economy
- 4 Automatic Work Stop
- 5 Automatic Coolant Pump Operation
- 6 Instantaneous Electro-Hydraulic Automatic Work Clamp

**ACCO**



*Write for  
"Principles of Abrasive Cutting"*

**CAMPBELL MACHINE DIVISION  
AMERICAN CHAIN & CABLE**

925 Connecticut Ave., Bridgeport 2, Conn.

**CAMPBELL**  
Abrasive Cutters  
and  
Nibblers



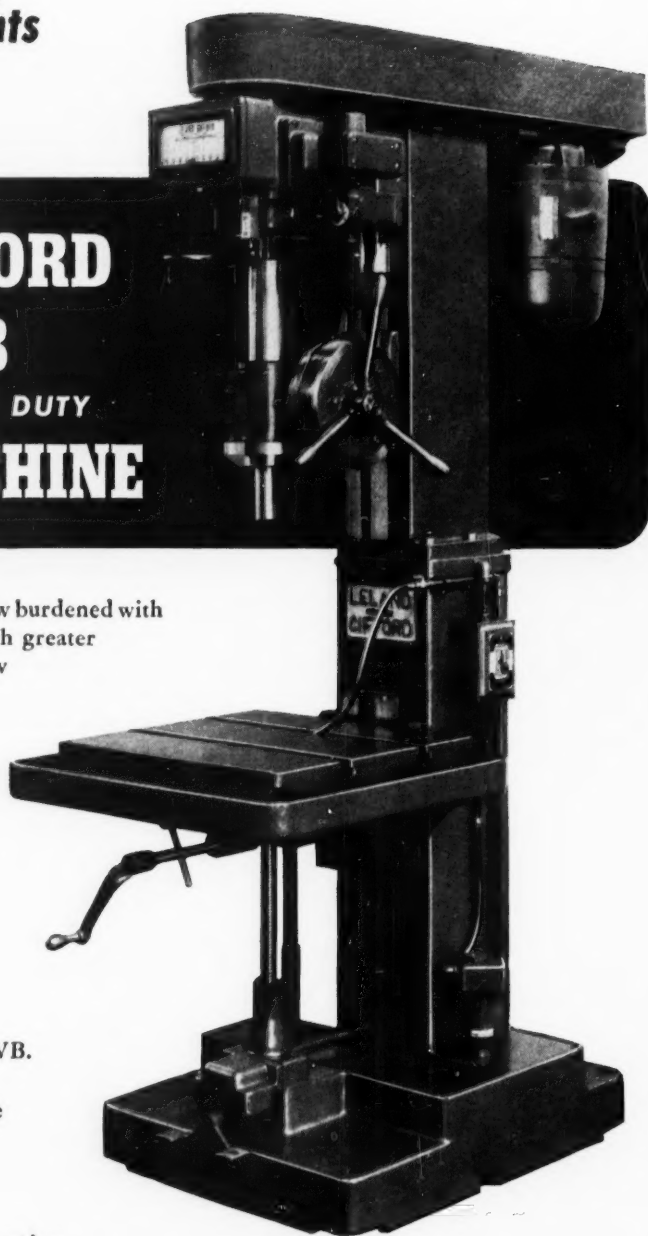


**Take the load off your  
Radials and Uprights  
with the NEW**

# **LELAND-GIFFORD No. 3 MVB 24" SWING — HEAVY DUTY DRILLING MACHINE**

Many a radial or heavy duty upright is now burdened with operations which can be performed with greater speed, economy and efficiency on the new Leland-Gifford No. 3 MVB. Rugged, powerful, versatile, it will handle holes up to 1 1/4" in steel or 1 1/2" in cast iron. Available with one to four spindles; power, hand or hydraulic feed; two or eight speeds with single or four speed motor and back gearing — it is adaptable to any general purpose or mass production drilling, tapping, reaming and counterboring assignment.

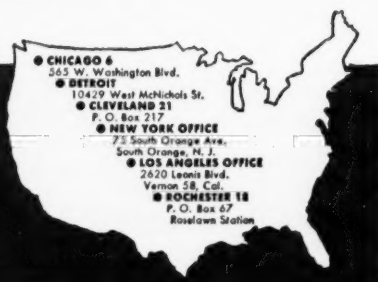
Look into the Leland-Gifford No. 3 MVB. It will not only pay for itself quickly — but give you an extra bonus by taking the load off more costly equipment.



*Write for Complete Information*

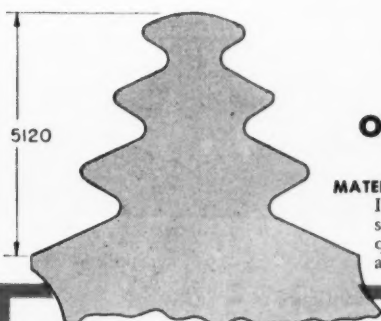
## **LELAND-GIFFORD** *Drilling Machines*

WORCESTER 1, MASSACHUSETTS, U.S.A.



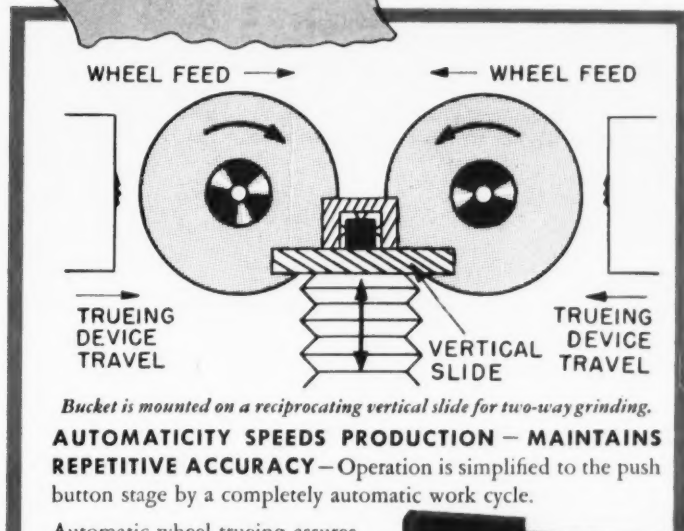
# FORM GRINDING

## JET ENGINE BUCKET ROOTS FROM THE SOLID!



### ON J & L DUAL-WHEEL AUTOMATIC FORM GRINDERS

**MATERIAL BORDERS ON UNMACHINABLE**  
Intense heat and great centrifugal stresses on the pressure surfaces require the toughest material and most accurate finish.



*Bucket is mounted on a reciprocating vertical slide for two-way grinding.*

**AUTOMATICITY SPEEDS PRODUCTION — MAINTAINS REPETITIVE ACCURACY** — Operation is simplified to the push button stage by a completely automatic work cycle.

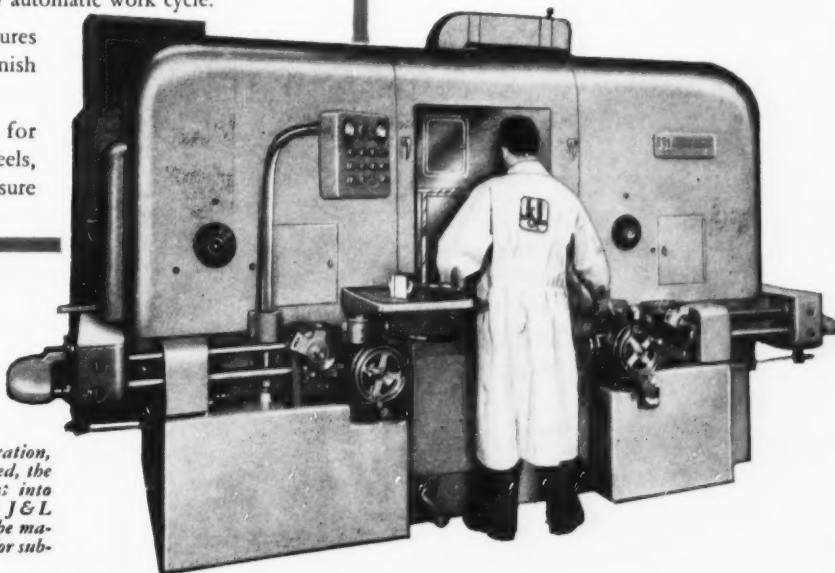
Automatic wheel trueing assures accuracy of form — includes finish trueing before final cut.

Automatic compensation for amount dressed off the wheels, and automatic wheel feed assure accurate sizing.

**FEW MORE DIFFICULT GRINDING JOBS EXIST** — Yet both sides of the root are ground simultaneously, to gage tolerances, on a production basis.

**REPETITIVE ACCURACY MAINTAINED**  
Spacing of pressure surfaces within .0002  
Taper within .0005  
Angles within 10 minutes  
Thickness from .0005 to .001

**ACHIEVEMENT RESULT OF SEVERAL YEARS' RESEARCH AND EXPERIMENTATION** — This application of the proven principles, long incorporated in J & L Thread Grinders, was initiated several years ago. The first machine was delivered in 1948. Continued study and subsequent refinements have helped lick one of the toughest machining problems of our day. Perhaps we can help you too.



Before the grinding operation, the foil contour is checked, the blade oriented and cast into a matrix, on a special J & L Optical Comparator. The matrix serves as a fixture for subsequent operations.

# JONES & LAMSON

JONES & LAMSON MACHINE CO., 512 Clinton St., Dept. 710, Springfield, Vt., U.S.A.



*Machine Tool Craftsmen  
Since 1835*

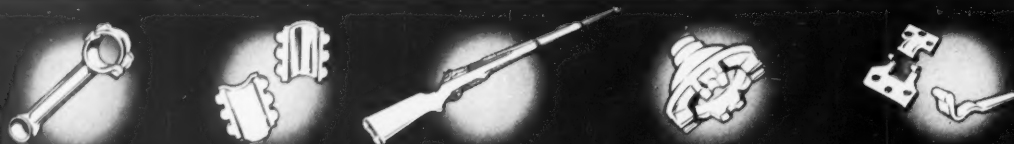
THREAD GRINDER DIVISION

For more information on products advertised, use Inquiry Card, page 239

MACHINERY, September, 1953—131

1 The year 1933 marked many automotive design and production advances. Among those on the production front was the first Detroit Broach tooling to broach connecting rods . . . an important advancement in terms of increased production, lower costs and better quality . . .

2 During the later thirties Detroit Broach continued to contribute to automotive broaching advancements. One example in 1938 was Detroit Broach tooling which made possible the complete finishing of main bearing caps cast in one piece in two passes . . .



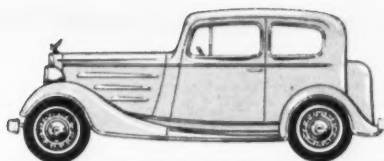
3 In the war years, the auto industry turned to war material and to Detroit Broach for the broach tooling for hundreds of parts. Typical was broach tooling to produce the rifling in gun barrels in a single pass and multiple-surface broaching operations on other gun parts . . .

4 Detroit Broach has continued to serve the auto industry in the post-war years. Tooling to broach differential cases, hinges, automatic transmission parts and innumerable other parts is helping to hold the line on rising production costs.

**TODAY**, automation has been introduced by Detroit Broach as an integral part of broach tooling. Parts are fed to, and carried away from, automatic broach tooling by specialized conveyor and hopper equipment. Tomorrow, too, one thing is sure . . . Detroit Broach will continue to pace the giant auto industry's need for better, more efficient production machining.

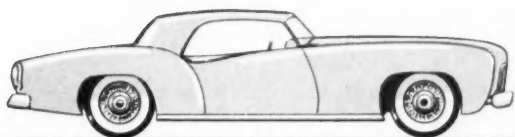
*This is a view of the new, all-modern Detroit Broach plant and engine located in Rochester, Michigan—just outside Detroit. Designed by Sture Fröden, eminent Swedish architect, it embodies many important advancements that contribute to employee morale and manufacturing efficiency. Another example of the unusual facilities of Detroit Broach Company.*





# *Broaching Pioneers*

IN THE AUTOMOTIVE INDUSTRY



Master of mass production techniques, producing at a level where pennies per piece mean thousands of dollars per year, the automotive industry was among the first to recognize the economies of broaching.

Early, too, came recognition of Detroit Broach ingenuity and reliability in the design and manufacture of tooling that would pace production requirements. A small sample of that tooling is shown at the left.

*in YOUR industry, too* you will find many companies who rely on Detroit Broach to meet their needs for tooling that slashes cost-per-piece, boosts output and provides consistent and repetitive top-notch accuracy.

Detroit Broach engineers, Detroit Broach facilities, in fact the entire Detroit Broach team, are all keyed to one specialized skill. That skill is broaching. It is such specialization that has resulted in many of broaching's greatest advancements.

It will pay you, too, to have a talk with the Detroit Broach representative in your area. You will doubtless find many ways to lower the boom on rising production costs on present as well as proposed operations.

*Detroit Broach* **COMPANY**  
**ROCHESTER, MICHIGAN**

*Offices in Principal Cities Throughout the World*

2104





# SOUTH BEND MACHINE TOOLS

*for Better, More Efficient Machining*

Here are precision machine tools that consistently hold down machining costs while producing work of better quality. Return the coupon for catalogs of quick change gear lathes, toolroom lathes, bench lathes, turret lathes, drill presses, shapers, pedestal grinders and attachments in which you are interested.



\$ \_\_\_\_\_ enclosed for handbooks checked

- ☐ How to Run a Lathe — 50¢  
☐ How to Run a Shaper — 25¢  
☐ How to Run a Drill Press — 25¢

## SEND CATALOGS CHECKED:

- ☐ 9" Lathes  
☐ Light Ten Lathes  
☐ 10" Lathes

- ☐ 13" Lathes  
☐ 14½" Lathes  
☐ 16" Lathes  
☐ 16-24" Lathes  
☐ Series 900 and 1000 (½" and 1" collet) Turret Lathes  
☐ No. 2-H (1" collet) Turret Lathes

- ☐ Complete Lathe Catalog  
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☐ 14" Drill Presses  
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Building Better Tools Since 1906 • SOUTH BEND LATHE • South Bend 22, Indiana



A SPINDLE YOU  
CAN *Specify*  
WITH  
**CONFIDENCE**



## THE **POPE** PRECISION SPINDLE

1 HP, 3600 RPM  
MOTORIZED

with Super Precision  
Roller Bearings  
and Separate  
Thrust Bearings

The picture shows you why this Spindle has swept the field for 6" x 18" surface grinder application (producing finer finishes at lower cost)—and why it has been promptly drafted for hundreds of other jobs.

There are many types of bearings but none can approach the superb combination of ruggedness and precision found in the double row cylindrical roller bearings you see in this Spindle. They

have tremendous load carrying capacity, produce a superior finish and assure long, trouble-free operation.

Note the thrust bearings. There is no endwise movement of the shaft in either direction.

Spindles have the Pope System of lubrication and are dynamically balanced in full assembly.

Applicable to all new grinders and to those now in service. Write for price and delivery.

No. 95

*Specify*

# **POPE**

PRECISION SPINDLES

POPE MACHINERY CORPORATION

Established 1920

261 RIVER STREET • HAVERHILL, MASSACHUSETTS

Save Time and Money... Select

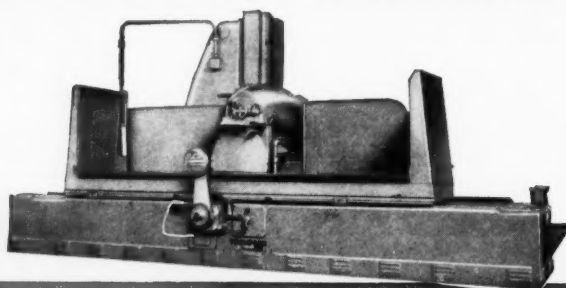
# THOMPSON

## HYDRAULIC SURFACE AND CONTOUR GRINDERS



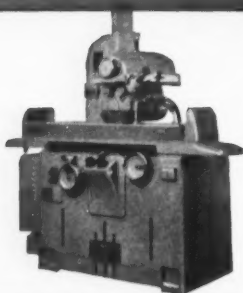
**TYPE B**

Small General Purpose Grinders  
size from 6x12x12 to 10x16x16



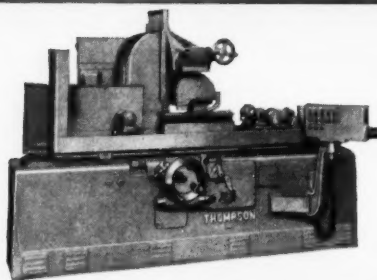
**TYPE C & CX**

Medium and Heavy Duty Grinders  
size from 12x16x12 to 36x36x36



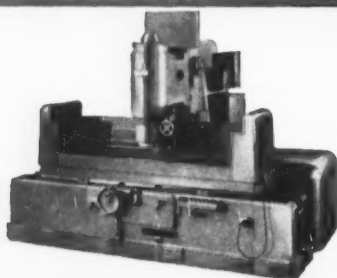
**TYPE F**

Tool Room Grinders available in  
size 6x12x12 and 8x12x12



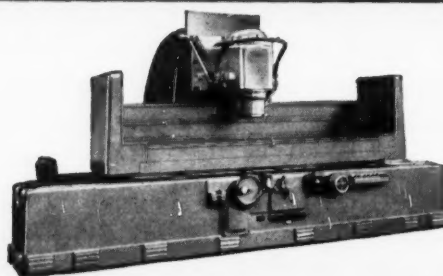
**TYPE E & C  
TRAUFORM**

Contour Grinders for all shapes  
size 10x12x12 to 16x16x16



**FIXED COLUMN  
VERTICAL SPINDLE**

Production Surface Grinders  
size 18x18x36 to 20x20x100

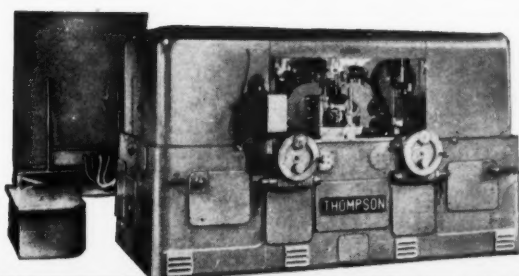


**SLIDING COLUMN VERTICAL  
HYDROVERT**

For obstructions or multi-level surfaces  
size 18x18x36 to 20x20x100

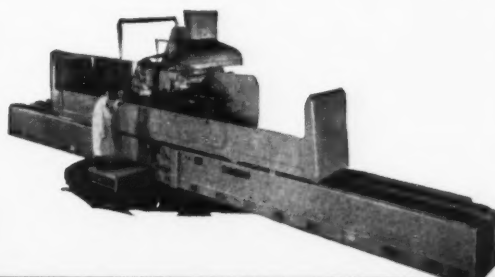
Write Thompson today for details . . .

- 1** **WIDEST RANGE** of light and heavy duty Surface and Contour Grinders
- 2** **HIGHEST ACCURACY** for lower costs
- 3** **PROVED QUALITY** for longer service
- 4** **SPECIAL MACHINES** for any surface and contour grinding application



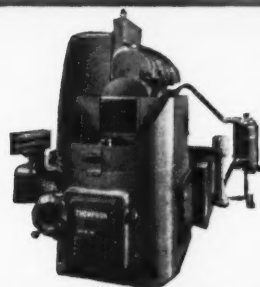
**DOUBLE WHEEL BUCKET  
AND BLADE GRINDER**

For jet aircraft



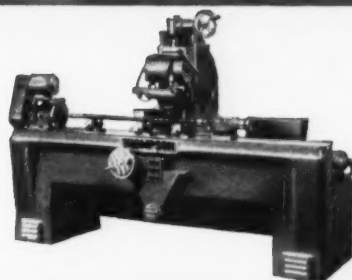
**WAY GRINDESS**

Many sizes and types from  
12x12x40 to 50x50x200



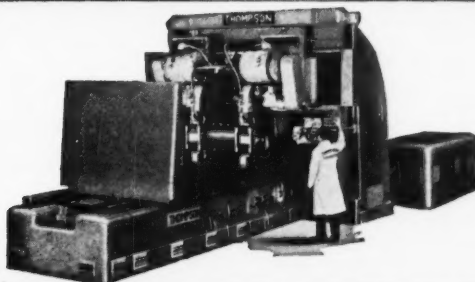
**TWIN CHUCK  
ROTARY GRINDER**

For grinding circular metal discs  
6 to 18 inch and 6 to 16 inch discs



**NEW SERIES 600  
MANUAL BROACH GRINDER**

discs 8x40 to 8x60



**RAIL TYPE  
HYDRAIL**

Widest grinder ever built  
discs 60x34x76 to 70x34x200

**Thompson**  
**SURFACE**  
**Grinders**

**The Thompson Grinder Co., Springfield 1, Ohio**



# OSBORN



## This wheel of fortune pays 20 to 1 on every turn

*In one minute* this machine does a job that formerly required 30 minutes! It shows what *you* can do with new OSBORN Power Brushing techniques to speed *your* production and cut costs.

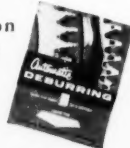
The job consists of deburring ends of stainless steel blades of a jet engine stator assembly. Chucked up in a grinder, as shown, the assembly rotates counter-clockwise at 20 rpm. An 8-inch grinding wheel grinds the

ends of the vanes. Burrs and feather edges are then removed by two OSBORN 10-inch Monitor® Brushes rotating at 2800 rpm—45 seconds in each direction. The complete cycle takes 1½ minutes. Vane ends are made uniformly smooth, 20 times as fast as former hand method.

The answer to *your* production problems may be found with special Osborn-equipped machines such as this . . . or with one of the Osborn Brushing Machines which are being

used in scores of plants for high-speed deburring. For *any* problem in deburring, cleaning and finishing, start tackling it with the powerful experience of your Osborn Brushing Analyst. Call him or write *The Osborn Manufacturing Company, Dept. D-9, 5401 Hamilton Avenue, Cleveland 14, Ohio.*

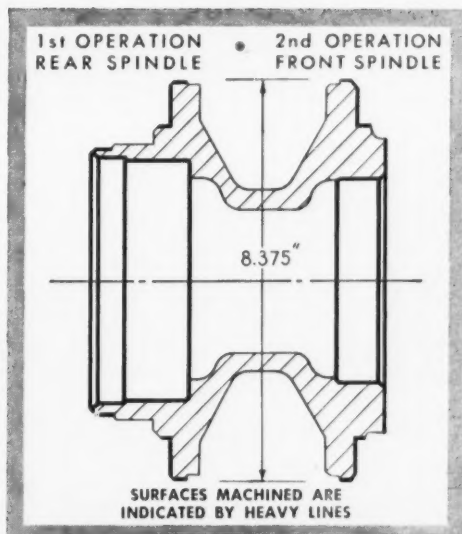
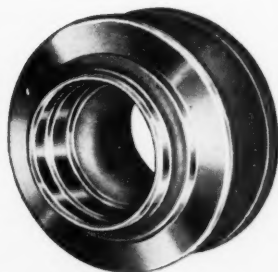
**FREE:** New booklet on deburring with Osborn Power Brushing. Write for your copy.



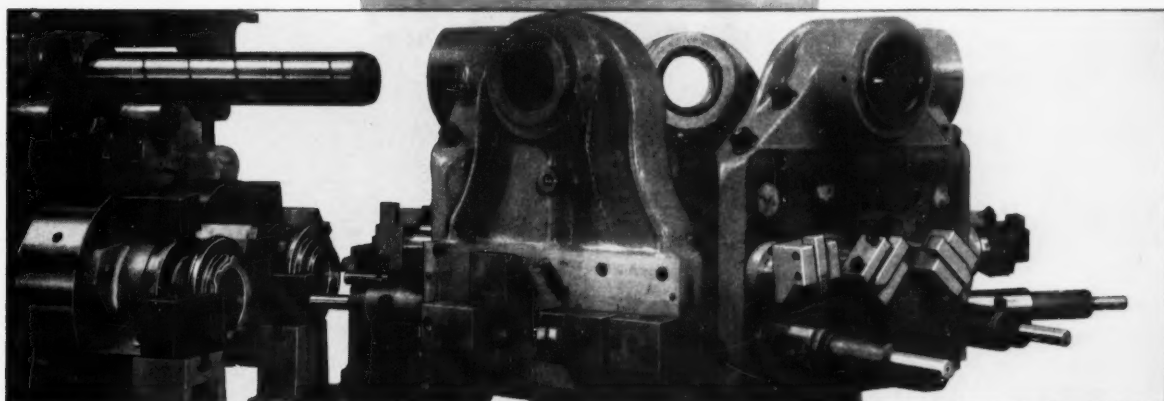
# Osborn Brushes®

OSBORN POWER, MAINTENANCE AND PAINT BRUSHES AND FOUNDRY MOLDING MACHINES

**COMPLETE**  
... ALL 38  
CUTS



... in **ONE**  
**TURRET**  
**CYCLE**

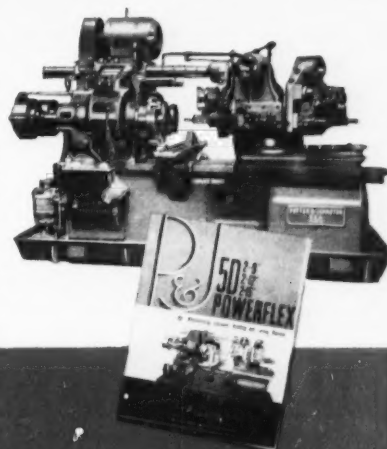


## with a 5D-2 Powerflex TWO-SPINDLE Automatic Turret Lathe plus P&J TOOLING

Looking for production geared to today's demands for increased output at lower costs? You'll find the answer in a P&J 5D-2 Two-Spindle Automatic . . . with P&J Tooling that makes the most of this machine's great production potential.

Two spindles give far greater output than the best obtainable from single spindle machines; initial costs, power consumption, floor space and operator attention are all much less than that required by two single-spindle machines. The result is **cost-cutting performance**. One of these malleable iron rollers is completed every 4.04 minutes — floor-to-floor time!

Get complete information about doing your tough, costly jobs the fast, economical P&J way. Send for your copy of 5D-2 POWERFLEX Bulletin 123 — or ask P&J Engineers to submit tooling recommendations based on your own prints or sample parts.



**POTTER & JOHNSTON Co.**

PAWTUCKET, RHODE ISLAND

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DIVISION NILES — BEMENT — POND COMPANY



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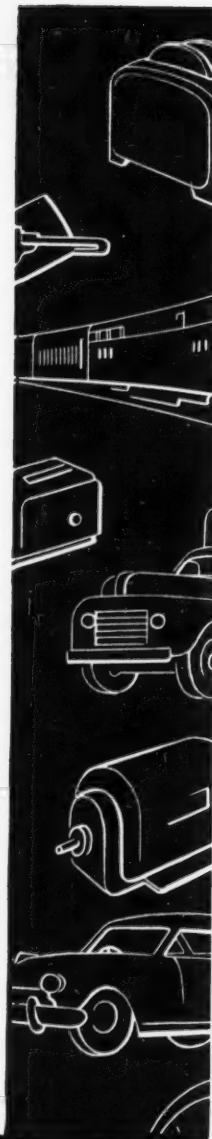
OF AMERICA'S BEST KNOWN PRODUCTS

USE **more**

*The Original*

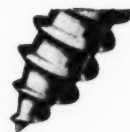
PARKER-KALON<sup>®</sup> SELF-TAPPING SCREWS

THAN ANY OTHER TAPPING SCREW



**... BECAUSE WITH P-K,  
PLANNED SAVINGS PAY OFF**

**Be sure  
you get  
P-K STANDARDS  
in POINTS**

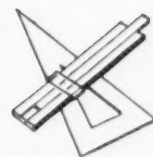


P-K point design makes sure the screw starts right, drives right. For example, by specifying P-K you can be sure of well formed, sharp gimlet points on Type A. With sharp point, P-K Type A stays upright, even when holes are misaligned—doesn't tip like a blunt point screw. It takes an extra operation, costs more to make the right kind of gimlet point, but P-K does it to give you fast, trouble-free assembly.

**ORDER from the local P-K DISTRIBUTOR . . .**

**the SUPPLY SPECIALIST that serves you.**





## WELL PLANNED IS HALF DONE

...but only half done, when you plan assembly. For screw failure can cancel all planned savings. That's why, to *insure* savings, so many fastening-wise manufacturers insist on Parker-Kalon Self-tapping Screws.

Since assembly expense is a sizable percentage of total production costs (in some products as much as 75%), they know fastening operations are a prime target for cost reduction.

Keep your assembly line trouble-free. Avoid screw failure, parts spoilage, high reclamation costs. Specify P-K Self-tapping Screws, and be *sure* planned savings pay off.

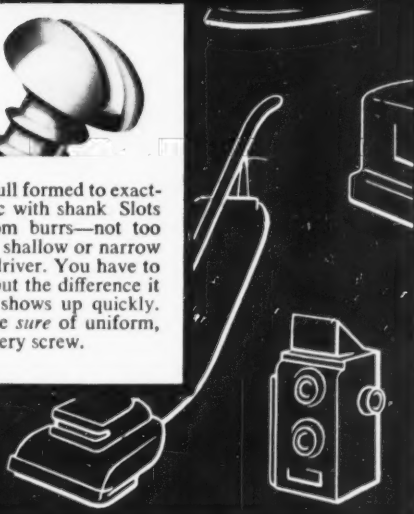
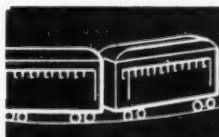


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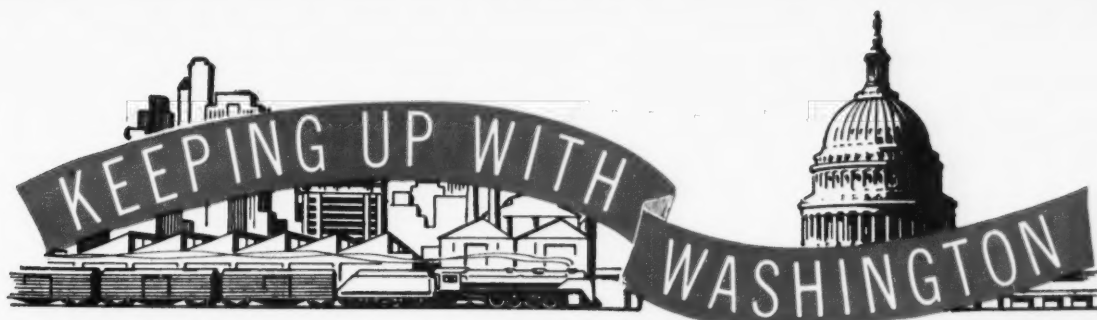
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## TEXACO

CUTTING, GRINDING AND  
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MACHINING



By LORING F. OVERMAN

## The Korean Truce Sets up Problems for Machinery Builders

WITH the Korean truce signed and Congress adjourned, new conditions are established for the machinery industries. Two conclusions are inescapable: (1) Barring unforeseen military emergencies, machinery builders will now look more and more to civilian activities for business volume; and (2) government budgets and general courses having been fixed for at least the next six months, the Defense Department and other agencies can now concentrate on performance, rather than on making a good impression at Congressional hearings.

### "Fasten Seat Belts"

Our economy has been emergency-propped for so long that many persons wonder whether American industry is still resourceful enough to build prosperity on something more constructive than munitions. Machinery people, particularly the producers of machine tools, are among the first to "take off" when the nation is under attack; first to start looking for the runways of normalcy when danger passes. As of today, the sign reads: "Fasten Seat Belts." In flights on commercial air liners, the maneuver of landing introduces momentary dangers forewarned by the flashing sign, but at the end of the runway await happy reunions and new experiences.

To slow the rate of descent and eliminate as much "landing" shock as possible, the Defense Department, Office of Defense Mobilization, National Production Authority, and others are still working with safety gadgets of several kinds. ODM has been having trouble from two angles. Its budget under surveillance, Defense Mobilization Director Arthur S. Flemming has been experiencing difficulty in recruiting personnel.

THE same situation has existed in NPA, the agency charged with administering remaining production controls. It is also supposed to have charge of the civilian end of the machine tool program, the generalities involved in planning the mobilization base, post-attack production, and "service" to business.

At press time, the Senate Appro-

priations Committee had cut in half the \$500,000,000 fund proposed by the Vance Committee as a down payment on a plan to stockpile production capacity rather than end products. Efforts were being made to restore the cut, but there were indications that such action might have to await a Defense Department report on its present ownership of machine tools.

### As of January 1, 1954

The Defense Department has indicated that by January 1, 1954, it will be able to tell all about the machine tools that it owns. "All" is understood to mean description, location, and condition of tools.

The Defense Department's inventory of machine tools, now being taken, is to include a survey of tools in government warehouses, in storage at contractors' plants, in government installations, and on production lines. The Vance Committee report several months ago indicated that the total number of machine tools involved exceeded 500,000 with a book value of about \$6,000,000,000.

Since the checkup is to include a report on the condition of machine tools, the inventory is expected to reveal important information about deficiencies in the tool program. With that information available, the Defense Department will be in a position to go ahead with orders recommended by the Vance Committee. The Department believes that it is on the right track in cataloguing its needs first, and hopes Congress will make available the money the Vance Committee recommended.

### Heavy Press Policy Reviewed

The much curtailed heavy press program was again under review recently. The study involved only the method of handling the extrusion presses. Originally, it had been planned to house each press in a completely integrated unit close to plants already occupied by companies which would operate the presses for government accounts.

In so far as heavy forging presses are concerned, the policy stands. Two of these presses will be operated by the Wyman-Gordon Co. at East

Grafton, Mass., and two by the Aluminum Co. of America, at Cleveland, Ohio. The 35,000- and 50,000-ton giant presses are too large to fit into existing plants.

The change in thinking so far as extrusion presses are concerned includes government construction of the presses and their lease to contractor-operators. The idea is that if the operator has such a press in his own plant on a lease basis, he may be expected to find uses for the press in making civilian products when the military program simmers down. Otherwise, the operator might have no particular incentive for developing uses for the press, and a skilled working force would be allowed to drift away when business fell off.

### Expansion Plan Approved

The President has approved legislation renewing the authority of secretaries of the military departments to acquire, construct, expand, convert, and otherwise develop privately or publicly owned industrial type plants and to establish a mobilization base through the acquisition and stockpiling of machine tools. The previous authority expired on July 1. The new law extends it to July 1, 1954, or until terminated by Congressional resolution. The law is typical of Congressional desire to be on the safe side of any emergency, but to maintain supervision over the military departments.

AN important recent shift was the transfer to the Chief of Ordnance, Department of the Army, of major ordnance research and development projects which have been handled by the National Bureau of Standards. The projects represent approximately 50 per cent of the operating budget of the Bureau. They include guided missiles, proximity fuses, rockets, and many highly classified items. For the present, the work will continue to be carried out in laboratory buildings on grounds of the National Bureau of Standards in Washington and in Corona, Calif. The transfer will enable the Bureau of Standards to place increasing emphasis upon standardization programs.

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## *Dignity, Honor, and Reward in Craftsmanship*

AMERICA was built on craftsmanship. Our forefathers hewed their way through the forests; tilled the soil with knowing hands; ground the harvests of the earth; hammered out their utensils and tools; and wove their own clothing. Later on, the skilled artisans in our factories laid the foundations for present high productive levels. There have always been dignity and honor in skilled manual labor, but of recent years proper esteem for craftsmanship has been lacking.

Educators in our public schools all too frequently feel that the value of their schools to the community is in direct proportion to the number of students who go on to institutions of higher academic learning. They seem to feel that it is almost a disgrace for students of high intelligence to choose a trade in preference to a profession.


On the high school level, a belittling attitude is often taken toward students of manual training or vocational schools. One large city in the Middle West found it desirable to drop the words "manual" and "vocational" in order to attract students to educational institutions of that category and simply call them "high schools," by inference placing them on the same social level as the schools specializing in academic courses. Sight is too often lost of the fact that many a plumber makes more money than a bank president and is just as worthy a citizen.

Parents and industrial leaders are almost as guilty as educators in disparaging the ad-

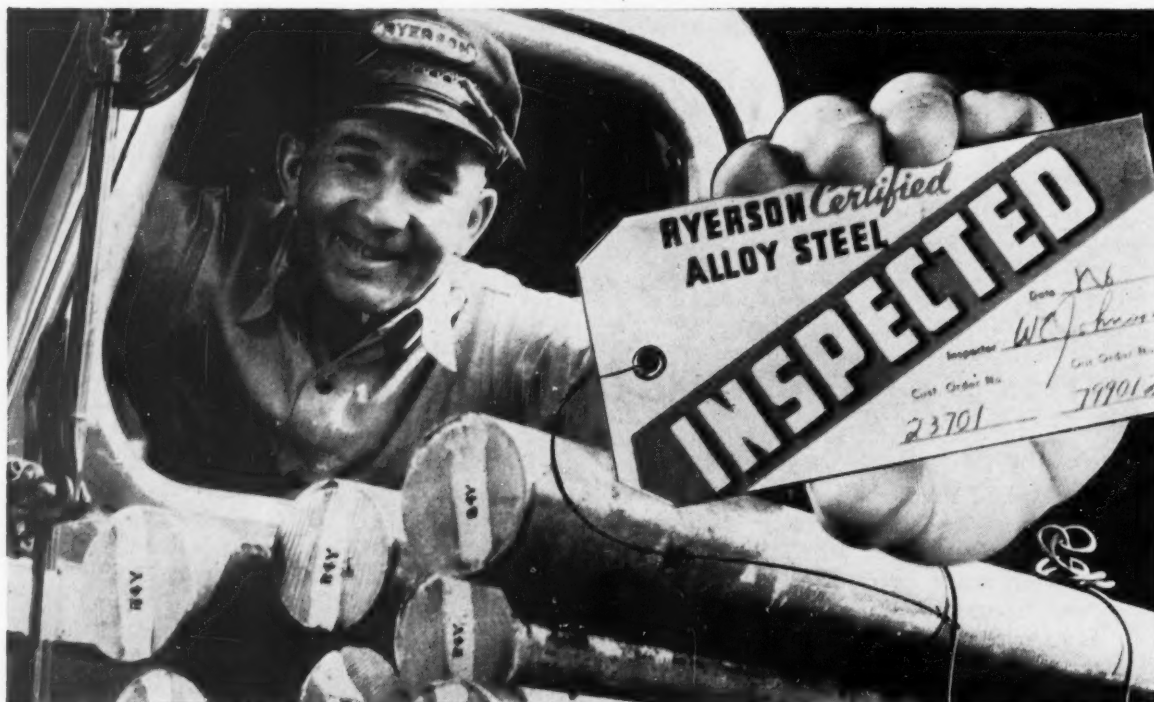
vantages of knowing a craft. They forget that industry is really built on the men who possess practical knowledge gained from working with their hands. Toolmakers, die-makers, electricians, and other craftsmen are just as necessary to an industrial plant as the engineers who give the orders for the shop men to carry out or the executives who look after the financial affairs and management problems.

Today, there is a dearth of skilled men in many trades and a lack of apprentices that could seriously handicap industry in the years ahead. Educators and parents should make a careful appraisal of the individual youth's talents in helping him to select his post high-school activities. Industrial leaders should promote the establishment of craft-teaching schools in their communities that would be well equipped and staffed to prepare students for successful careers in industry—schools such as the one that Cincinnati is building at a cost of about \$7,000,000. Already in partial operation, this school will take care of 3000 students. Central High School has a stadium with a seating capacity of 16,000 persons, indicative of the fact that this school is to be considered on a level with college preparatory schools. More projects like this are urgently needed.

As the schools reopen for the fall term, let us remind the enrolled trade students that hundreds of shop men have advanced to be heads of their companies. There are direct roads to success from the bench and the machine to executive jobs.

  
EDITOR





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# BENDING

## Thin-Wall Tubing

By FRANK PESAK  
Production Design Engineer  
North American Aviation, Inc.  
Los Angeles, Calif.

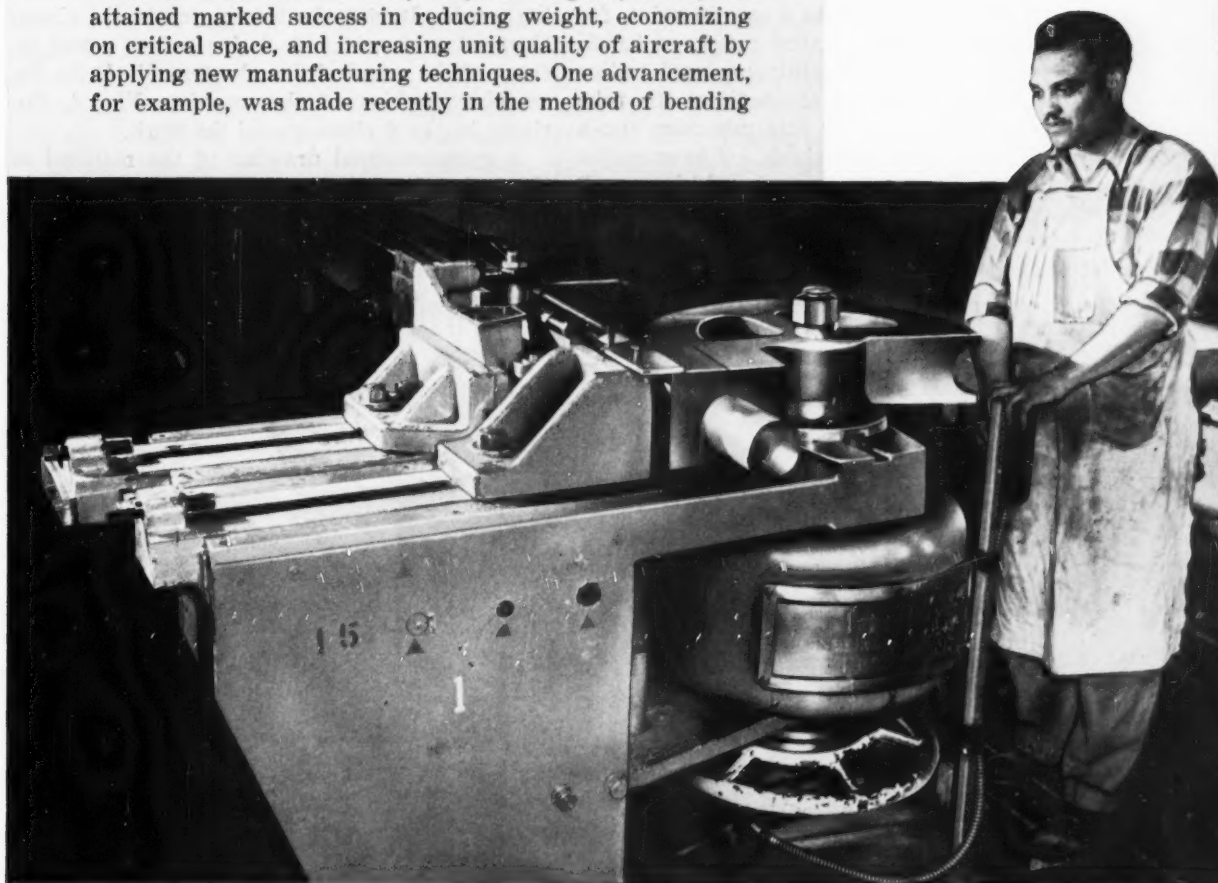
VOL. 60 NO. 1

MACHINERY

SEPTEMBER 1953

**I**NCREASED engineering requirements for saving weight and space in current and prototype aircraft designs often extend certain fabricating methods beyond practical means. In addition, new materials used in the construction of aircraft, such as titanium and 17-7 PH stainless steel, multiply production problems. Together, these developments frequently necessitate drastic revisions of tools and methods.

North American Aviation, Inc., Los Angeles, Calif., has attained marked success in reducing weight, economizing on critical space, and increasing unit quality of aircraft by applying new manufacturing techniques. One advancement, for example, was made recently in the method of bending





*Fig. 1. Drop-hammered and welded thin-wall aluminum tubing is shown at top; other aluminum tubing, center and bottom, is bent to a radius equal to one times its diameter.*

thin-wall tubing for the high-pressure ducts of heating and ventilating systems. Tube sizes vary from 1 1/2 to 4 1/2 inches (outside diameter), with wall thicknesses from 0.016 to 0.049 inch.

Past experience in bending thin-wall tubing, both ferrous and non-ferrous, presented some very definite limitations. As a case in point, for 2-inch corrosion-resisting steel tubing of 0.035-inch wall thickness, the minimum bend radius was 14 inches—equal to seven times the tube diameter. A radius below this minimum for a purely tubular detail invariably led to excessive scrap losses. The only manner in which a small radius could be obtained in thin-wall tubing was by fabricating the detail in two parts under the drop-hammer, then welding them together.

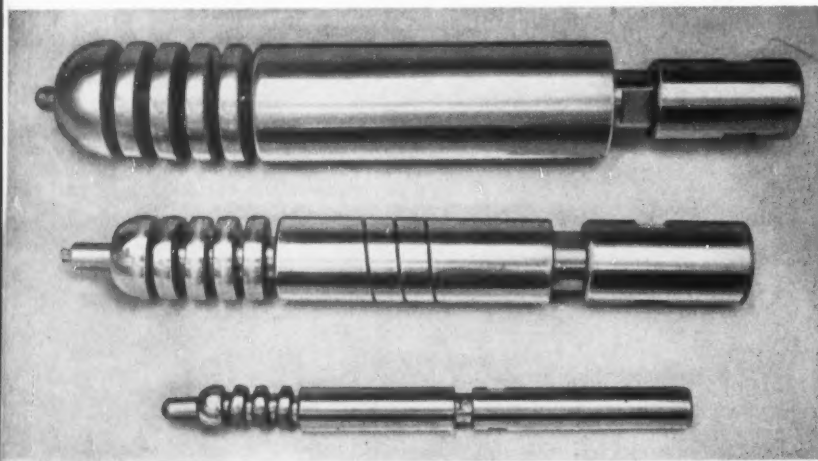
Now, on a production basis thin-wall tubing is being bent to radii as small as two-thirds of

the tube diameter, through 130 degrees, in single- or tangent-bend configurations. Wrinkle-free tubular sections are being produced of 52S-O and 61S-O aluminum, and AISI 347 and 321 stainless steel. In Fig. 1, drop-hammered and welded tubing (top) is compared with typical bent tubing (center and bottom).

The success of current bending operations can be attributed to the use of flexible mandrels of a unique design, as shown in Fig. 2. These mandrels consist of a series of interlocking spherical segments attached to a shank by a spring-loaded cable. The work is supported on the mandrel, with the bend area directly over the "doughnuts." The mandrel is used on conventional bending machinery, in conjunction with a suitable radius block, clamp block, and wiper die. A separate mandrel is required for each size of internal diameter of tubing, but the same mandrel can be used to obtain any size or plane of radius.

The various components of a flexible-mandrel bending set-up can be seen in Fig. 3, which shows a machine in open position ready for loading a tube. During the bending cycle, the clamp blocks *A* and radius block *B* pivot as a unit in front of the mandrel *C* and wiper die *D*. In the working position of the machine, Fig. 4, the clamp blocks *A* close around the work.

A cross-sectional drawing of the mandrel is shown in Fig. 5. To the left of the shank *A* are the small and large segments *B*, arranged alternately on the cable *C*. A retaining cap *D* is swaged on the exposed end of the cable. Within the shank, the cable runs through a spring *E*, and its inner terminal is swaged to another cap



*Fig. 2. For a particular internal diameter of tubing, only one of these flexible mandrels is needed to obtain any size or plane of radius.*

*Fig. 3. This bending machine is in open position, ready for loading a tube. View shows the location of flexible mandrel (C).*



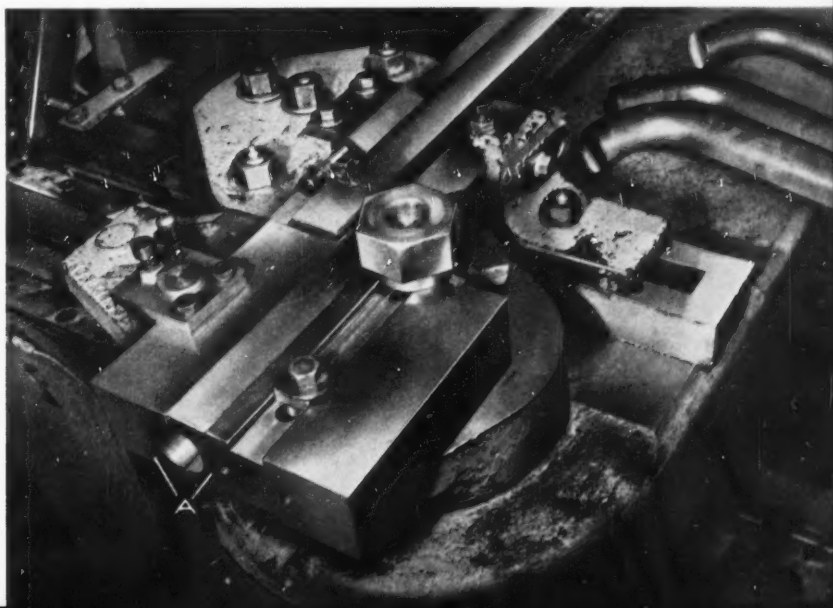
*F* at the right-hand end of a sleeve *G*. In operation, the segments flex to the radius assumed by the tubing, and the spring maintains the shank in contact with the segments. At the same time, the shank moves back over the sleeve. With the release of the bent tubing from the mandrel, the cable returns to its straight-line position.

The length of the flexible section of the mandrel for small-radius bending of thin-wall tubing in the range of 0.028-inch wall thickness is calculated at one and three-quarters times the outside diameter of the tubing. Thinner walls require a longer flexible section to prevent the bent tubing from collapsing. The larger segments are 0.003 inch smaller in diameter than the shank. For a general-purpose mandrel, liquid-nitrided SAE 4340 steel or a 5 per cent chromium air-hardening tool steel is ideal. Frequently, bronze-coated mandrels are used to reduce the scoring that is so prevalent in working stainless steel. The bronze is applied to the steel segments and shank by arc-welding.

In Fig. 6 are close-up views of the principal components of the bending tools: the flexible mandrel *A*, radius block *B*, clamp block *C*, and wiper die *D*. The steel radius block, around which the tubing is actually bent, has the radius of the required bend. Its periphery is grooved to correspond to the outside diameter of the tubing. After the block has been turned to size, a special radius tool is used to cut the groove in a lathe operation. A 1/8-inch lip *E* is milled beyond the true radius of the groove. This lip permits the tubing to move outward because of its thickness in the compression area. At the same time, it totally confines the tubing in that critical area. Following machining, the wear surfaces of the block are chromium-plated.

Clamp blocks, which grip the straight section of the tubing in the area ahead of the flexible section of the mandrel, are bored in pairs for single-plane bends. The gripping area of the clamp block is 0.008 inch smaller than the nominal size of the tubing. One-half of the block is

*Fig. 4. In actual operation, a tube would be gripped between the clamp blocks (A) when the machine is in the working position illustrated.*





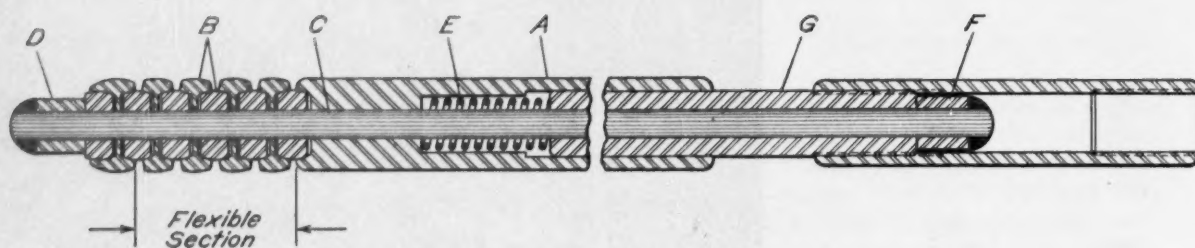


Fig. 5. Segments (B) flex to the radius assumed by the tubing during the bending operation, then spring back when the tubing is removed.

drilled and fastened to the slide of the bending machine. The other half, C in Fig. 6, is drilled and fastened to a milled area in the radius block. All clamp blocks for tangent bending operations are cast of Cerromatrix or Kirksite.

The wiper die D is indispensable to the successful small-radius bending of thin-wall tubing. By extending to the tangent point of the bend, the die serves as a restricting surface to the inside of the bend radius. Producing the feather-edge F of the die is probably the most difficult phase of fabricating tube-bending tools. The semicircular surface is formed by boring out a tubing insert, then cutting off the upper half G.

Before removing the upper half, the end of the die is milled to the contour of the radius block. This is done by mounting the work on a rotary table, then feeding it against a corner-rounding cutter. The featheredge is produced by performing this operation on both sides of the die. Fig. 7 shows how the surplus stock which forms the upper half of the semicircular surface, supports the featheredge while it is being produced. All

working surfaces of the wiper die are chromium-plated for wear resistance.

Proper machine and tool set-up is highly significant in producing wrinkle-free tubular sections. Many factors contribute to unsatisfactory results, however, the foremost being improper slide-block and wiper-die pressures, slipping of the tubing in the clamp blocks, severity of the bend, and unsteady bending cycles. Insufficient slide-block pressure causes wrinkles that cannot be removed by the flexible section of the mandrel; and excessive slide-block pressure permits the tubing to slip through the clamp blocks, fracturing as it does so. This slippage causes the material to work-harden (aluminum being more subject to this action than stainless steel), thus increasing scrap losses.

Requirements for setting the flexible mandrel are not as precise as those for an ordinary plug mandrel. One setting—about 1/16 inch ahead of the tangent point of the radius—serves all bending jobs, regardless of the diameter, thickness,

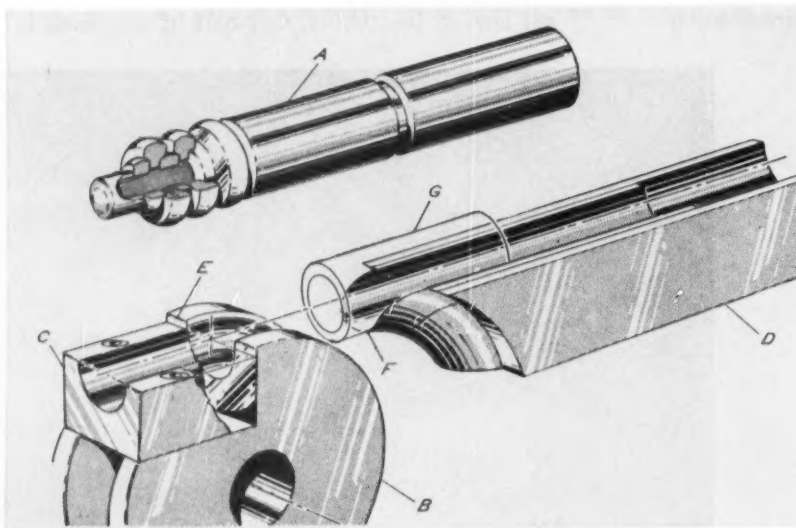
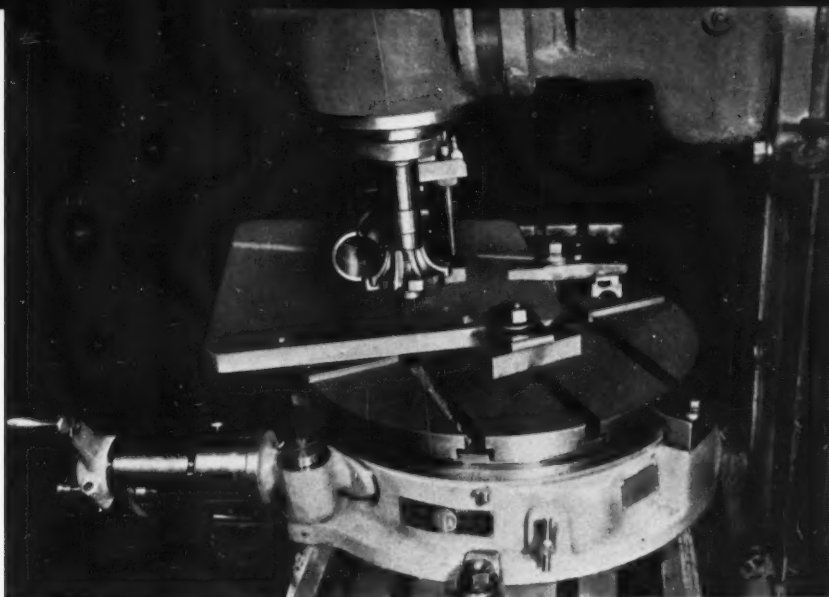


Fig. 6. This view shows the relative positions of the flexible mandrel (A), radius block (B), clamp block (C), and wiper die (D).

Fig. 7. In a milling operation, a corner-rounding cutter produces the featheredge of the wiper die.



or bend radius of the tubing. On the other hand, a plug mandrel has to be precisely set for each job.

Supplementary tubing actuators serve to overcome the drag created by the slide-block, mandrel, and wiper-die pressures. For light-gage large-diameter tubing, the actuators are of considerable value in reducing the tendency to fracture. The work can be helped through the bend by applying end pressure with a yoke attachment, or by actuating the slide block itself. Heavy bending machines, such as the No. 4 Pines in the heading illustration, are essential, the ample power of the equipment permitting a steady and uninterrupted cycle.

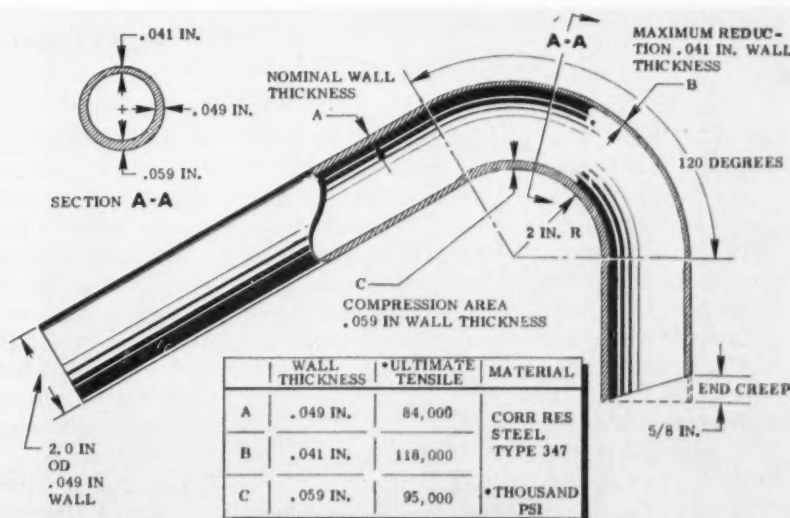
The condition of the material, particularly of stainless steel, is another important factor in the degree of success encountered in tube bending. Annealed tubing as received from the mill should

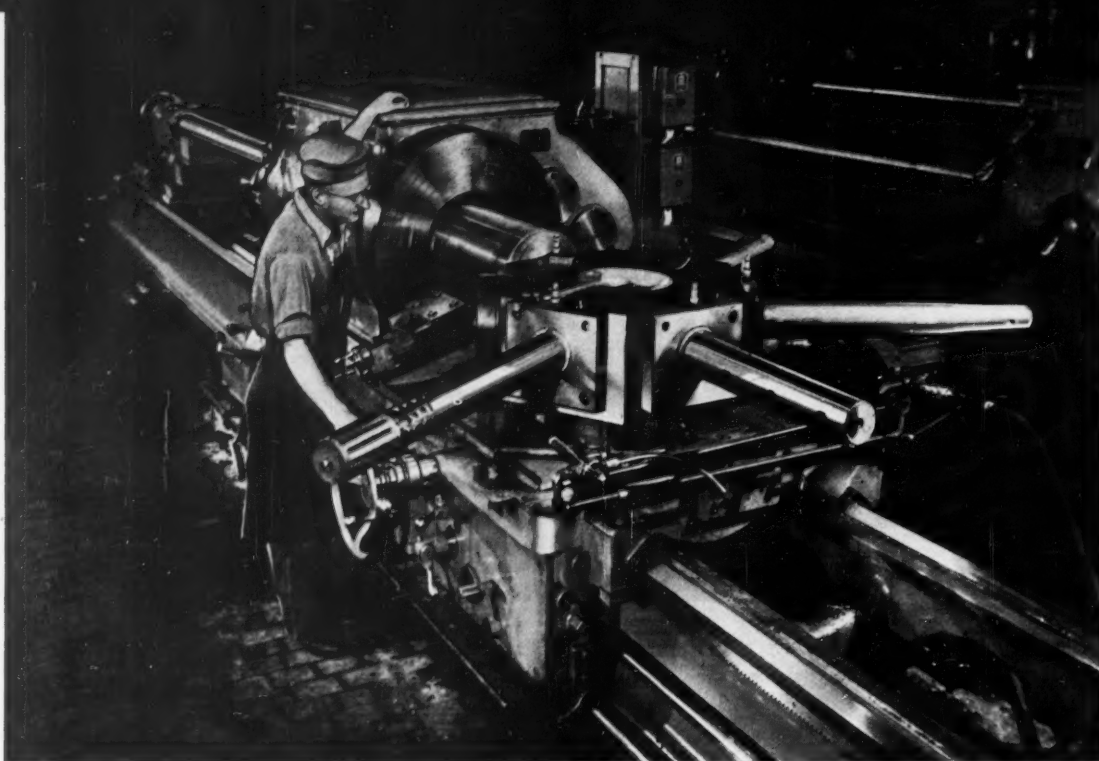
be annealed further to reduce it to the required dead-soft condition. Welded, redrawn AISI 347 stainless steel can be bent to a radius equal to two-thirds its diameter if care is exercised in restricting the weld seam to the inside, or compression, area of the bend.

From the standpoint of product design, it should be noted that end bends are preferred to bends between long, straight sections. Severe small-radius bends may extend thin-wall tubing beyond its physical limits. It is therefore preferable to locate these bends at end sections, where the material can creep.

The changes in thickness of a typical tubing wall in the bend area are shown in Fig. 8. Although the outside, or tension, area of the bend has been reduced in thickness, cold-working the area imparts superior physical qualities which more than compensate for the reduction.

Fig. 8. This drawing shows the change in wall section of a piece of 2-inch steel tubing, having a nominal thickness of 0.049 inch, that was bent 120 degrees to a 2-inch radius.





## How Oldsmobile Machines 90-Millimeter Cannon

**Modern techniques and machines turn out work of high quality at fast rate. In one case, 20 pounds of chips are produced per minute despite the hard and tough stock**

By JOHN G. COLEMAN  
Supervisor of Production Engineering-Machining  
Oldsmobile Division, General Motors Corporation  
Lansing, Mich.

**W**HEN the manufacture of 90-millimeter cannon was undertaken by the Oldsmobile Division of the General Motors Corporation as part of its defense work, the production engineers profited by experience gained in World War II and applied the most modern techniques to speed output. Major components of these cannon are either centrifugal castings or forgings of high tensile strength, which are made of tough chromium-nickel-molybdenum steel.

In most cases, the cannon parts are received in the heat-treated condition and have a hardness of 40 Rockwell C or higher. In some instances, cuts up to 5/8-inch deep are required, partly be-

cause plenty of stock is allowed for finishing in order to insure the removal of surface defects often encountered in heavy forgings. A case in point is the forging for the breech-ring, which approximates the dimensions of a 15-inch cube. The rough forging weighs more than 800 pounds and is reduced about 250 pounds in weight in boring the central hole for the barrel, in boring other holes, and in machining the six faces. The heading illustration shows an operation on the cannon barrel performed on a Lehmann lathe.

Several operations on the external surfaces of the breech-ring are performed by special two-spindle Cincinnati milling machines designed for

high-speed cutting with inserted carbide-tipped cutters ranging from 10 to 18 inches in diameter. Each cutter-spindle is driven by a 50-H.P. motor. In certain operations, such as those illustrated in Figs. 1 and 2, more than 20 pounds of stock are converted into chips every minute.

It is essential to employ sturdy fixtures in such operations to avoid deflection of the fixture as the work-piece is advanced between the two cutters. The feed is generally from 8 to 10 inches a minute, and cuts  $3/8$  to  $5/8$  inch in depth are taken. The feed per tooth ranges up to 0.010 inch with a cutter speed of 225 feet per minute.

Much less metal is removed in drilling a small hole to a depth of  $9\frac{1}{4}$  inches in the breech-ring to receive a trigger plunger. However, this operation is a difficult one because the hole must be held within 0.502 and 0.503 inch in diameter and its axis must not deviate more than 0.005 inch from being parallel with the axis of the breech hole over its entire length.

This would be a difficult operation even in metal that machines freely, because drills, particularly those of small diameter, commonly tend to run-out in deep-hole work. If an error is made in excess of the limits specified, the hole cannot be corrected and the forging must be scrapped, even though in its rough form it is worth several hundred dollars.

The problem of drilling this hole was solved by using a gun drill on an Ex-Cell-O precision boring machine equipped with a simple fixture for holding the work-piece securely, as shown in Fig. 3. The gun drill was made by the Na-

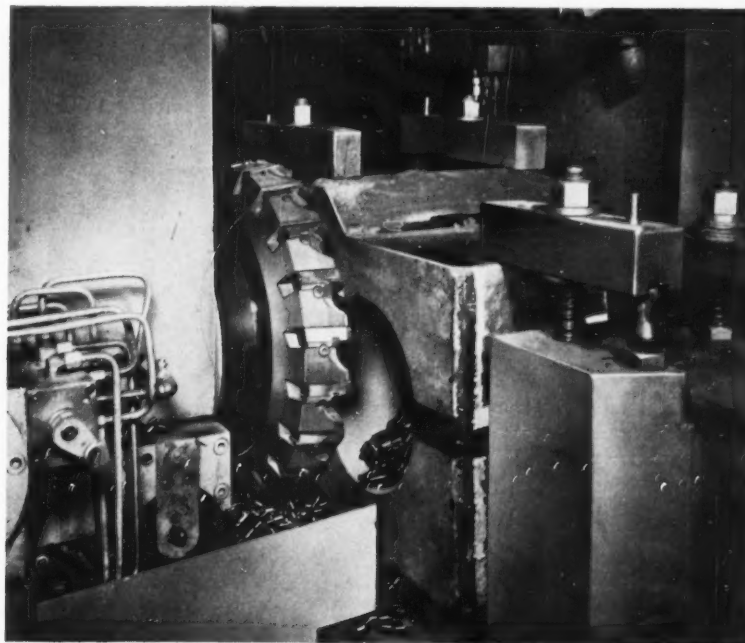
tional Twist Drill Co. in accordance with the drawing shown in Fig. 4. The drill shank is slightly under  $3/4$  inch in diameter and is 3 inches long. Into one end of the shank is fitted a ground tube of 0.493- to 0.490-inch diameter, which extends 16 inches beyond the shank end. The tube is recessed into the shank for a distance of  $3/4$  inch and, at the opposite end, a short steel bar is brazed to the tube to accommodate tungsten-carbide tool bits. For the greater part of its length, the wall on one side of the tube has been pressed in toward the center in such a way as to form a trough or straight flute which is continued across the steel tool-bit holder to the cutting edges.

Running longitudinally through the bar are two  $7/64$ -inch holes, as shown by the end view in Fig. 4. The central hole in the end of the drill forms a core as the drill makes its cut. The drill advances over this core, and thus the core serves as a central pilot-pin about which the drill turns. Actually, the core remains fixed to the work until the drill breaks through the far end of the breech-ring. Then the core is withdrawn with the drill in the form of a straight rod.

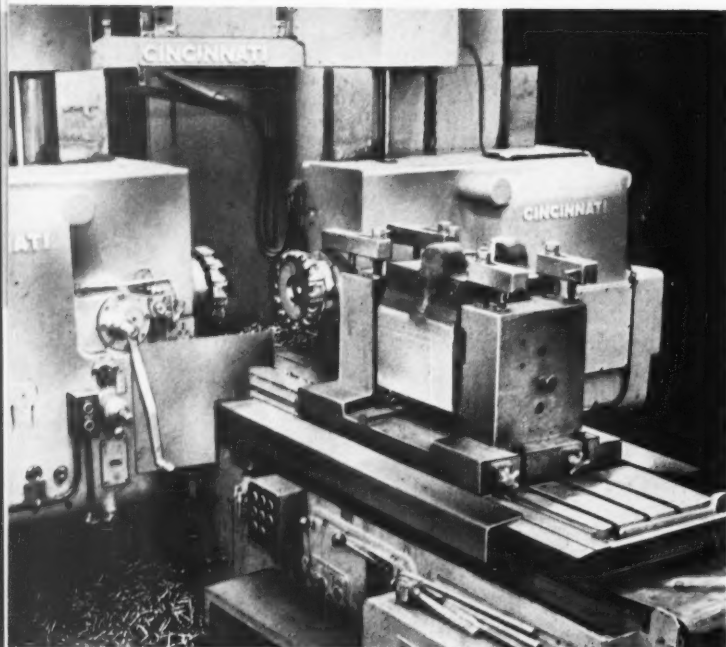
Cutting oil is fed through the off-center hole in the drill at a pressure of 250 pounds per square inch. The oil is forced back out of the work through the flute previously mentioned, carrying with it all chips.

The drill is driven at a speed of 1140 R.P.M., its maximum surface speed being approximately 150 feet per minute. It is fed  $1\frac{1}{8}$  inches a minute, or about 0.001 inch per revolution. The hole

*Fig. 1: One of two large carbide-tipped cutters employed in straddle-milling the side faces of a breech-ring for a 90-millimeter cannon*







*Fig. 2. Motors of 50-H.P. rating drive each spindle of the straddle-milling machine for removing chips at rates up to 20 pounds per minute.*

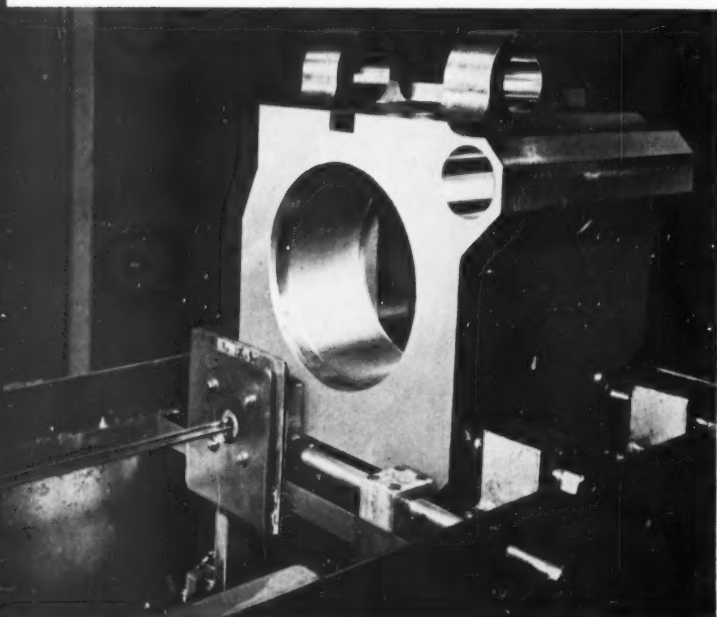
is drilled in less than ten minutes. Actual run-out is held below 0.0003 inch, and a finish as good as 35 micro-inches r.m.s. is attained. It is not necessary to withdraw the drill until the hole is completed.

In general, about five holes are produced per grind of the drill. The latter must be kept sharp to obtain the proper finish and to avoid scoring. Oil is supplied to the drill through the hollow spindle. The total drill time per hole, including the time involved in setting up the work, is only twenty minutes—as against four to six hours required in a former set-up that was virtually of tool-room type.

Twenty-seven broaches are required to cut a

T-slot in the breech-ring because of the hardness and toughness of the steel from which the ring is made. Broaching is done on a Lapointe hydraulic pull-down type of machine. The work is clamped in a fixture on a shuttle slide so that it can be brought forward over the broach after loading and then receded for unloading.

To make certain that the broaches are used in their proper sequence, they are placed in the circular turret, seen at the left in Fig. 5, after every use. There is a separate vertical holder for each broach. In an operation, after the work has been brought into the broaching position, each broach is pulled through the hole in the work to take its cut. After the broach has cleared



*Fig. 3. A gun drill of special design is used for producing a 1/2-inch hole through 9 1/4 inches of tough steel with a continuous feeding movement.*

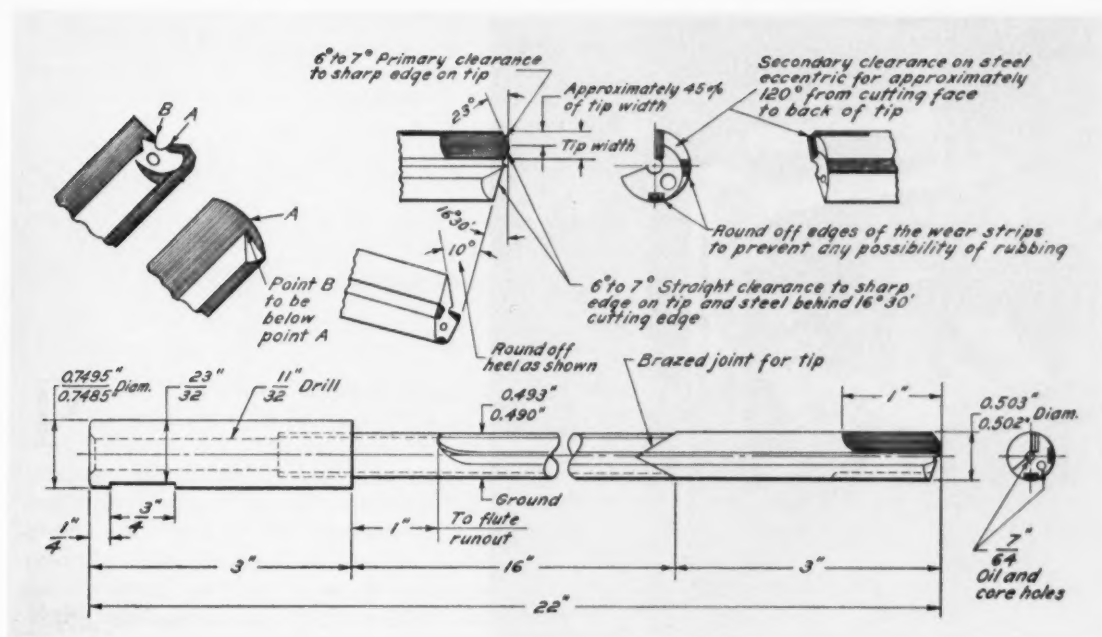


Fig. 1. Drawing of the hollow gun drill which produces a small trigger-plunger hole.

the work, the slide moves the work back out of the way and then the broach is elevated, removed from the machine, and returned to its holder on the turret. It requires about twenty-five minutes to broach each piece. Hand filing after broaching is practically eliminated.

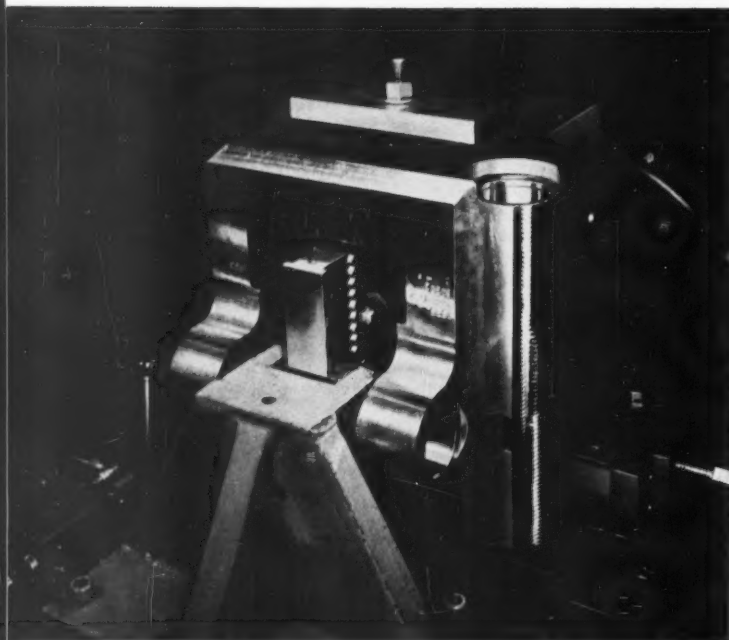
Although most metal is removed from the gun components by machining, the breech-block forging, which measures 6 by 8 1/4 inches in cross-section by 16 1/8 inches long, is brought close to the rough size by flame-cutting. Oxygen and acetylene are fed at 12 pounds per square inch

to produce a flame from a torch supported by the pantograph shown in Fig. 7. After the block has been preheated to 850 degrees F., flame-cutting is done in four successive positions of the breech-block. Steel forms or follower blocks are attached to the machine table to guide the follower automatically as the torch is moved along corresponding paths around the work.

During the four cuts, the work-piece is held by its own weight against stops on the second table (seen in the foreground of Fig. 7) with one end overhanging a slot above a slag pit. In the



Fig. 5. Pull-down hydraulically actuated broaching machine that utilizes twist-steel broaches in the operation of cutting a T-slot

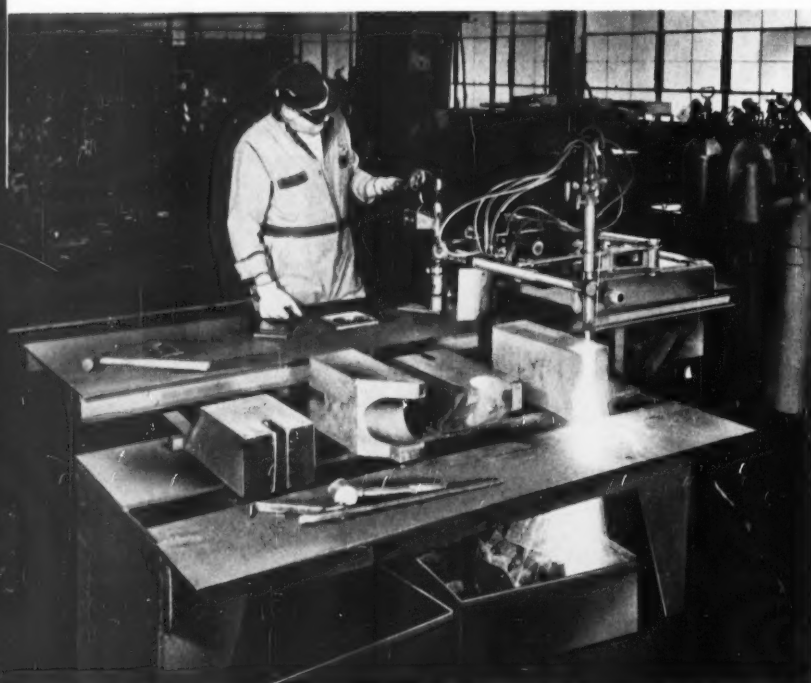


*Fig. 6. Close-up view of the machine in Fig. 5, the work being held on a shuttle slide which moves back and forth between usage of successive broaches*

first position of the work, as seen at the right, one corner is cut off the forging at an angle to produce a beveled step. Next, a U-shaped cut is made in the forging, as seen on the part in the second position. Then, in the third cut, the bevel is extended over one side of the U-shaped surface. Finally, a deep narrow slot is cut into the opposite end of the block, as shown by the part in the extreme left-hand position. All four opera-

tions are performed in a total of about ten minutes, 55 pounds of steel being removed in a time far shorter than would be needed if a saw were used or the stock cut away in the form of chips.

Only a few high spots in the production of cannon in the Oldsmobile plant have been described in this article. Other operations are done on a similarly efficient basis but, in most cases, they follow conventional procedures.



*Fig. 7. Day-acetylene pantograph machine used for quickly removing excess metal from the breech black forgings*

# Much Special Tooling Needed for Landing-Gear Production

By R. E. REITER, Manager  
Landing Gear Division, Willys Motors, Inc.  
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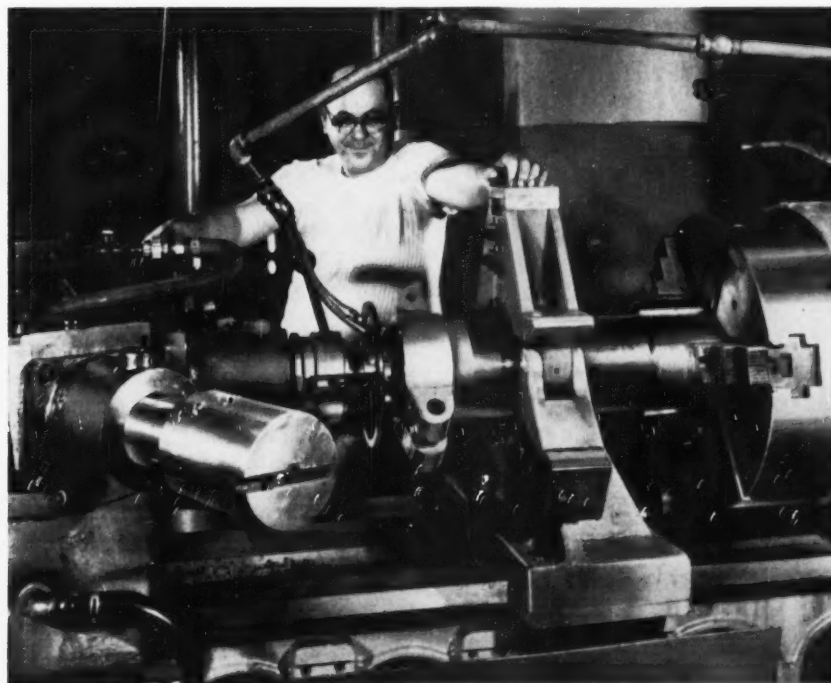
**P**RODUCTION of aircraft components is a well established procedure at Willys Motors, Inc., Toledo, Ohio. But when this company contracted recently to build landing gears for "flying boxcars" needed by the United States Air Force, it was necessary to completely re-equip a sizable plant for the job. A few high spots relating to machine work on major parts of the landing gear are of interest because of the special tooling that is involved.

All principal parts are of tough chromium-molybdenum steel. Many of these are forgings, some of which subsequently become part of weldments. Since they are hardened to 42 Rockwell C scale before machining is completed, cutting the material is a rather difficult job. The components are mostly of large proportions, and because they

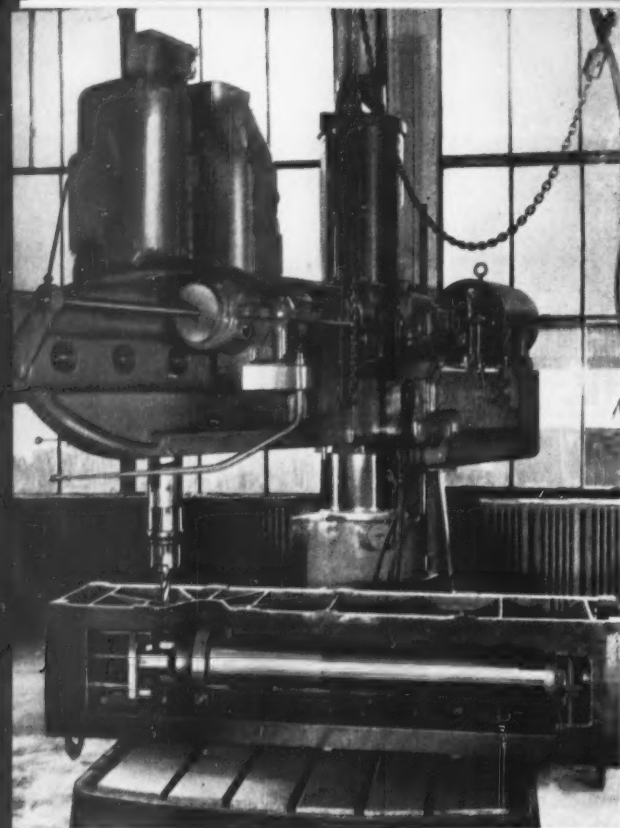
are required only in moderate quantities, production differs radically from that involved in motor vehicle manufacture. One of the largest parts machined is the main leg cylinder of the landing gear, consisting of a tube with a forging welded to each end.

As can be seen in Fig. 1, the cylinder is held in a universal chuck and supported with a steadyrest for a series of boring, reaming, and tapping operations on a turret lathe. First, two diameters are bored and reamed. Next, a 6 5/8-inch thread of 16 threads per inch is cut in the bore at a point more than 3 feet in from the exposed end of the cylinder. This is done with a solid tap having an integral follower to center the tap in the bore. A 7 1/2-inch thread, of 16 threads per inch is cut with a large collapsible

*Fig. 1. A collapsible tap cuts a 7 1/2-inch thread of 16 threads per inch at the end of the forging.*







*Fig. 2. The substantial size of the fixture permits it to overhang the drilling machine base and still support the work without distorting it.*

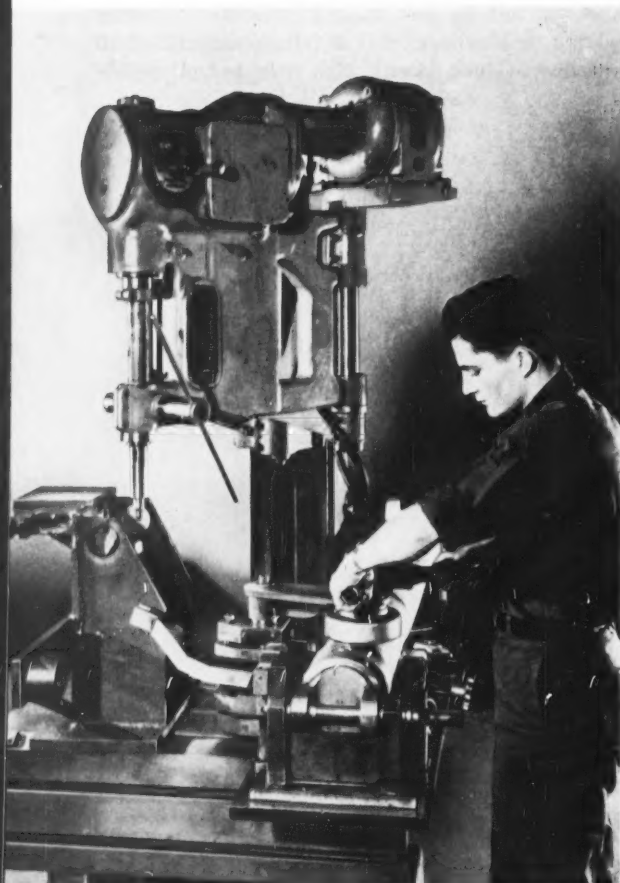
tap in the end of the bore. In the illustration, the turret has been indexed for this operation. A steadyrest supports the outer end of the cylinder.

After tapping, outside diameters and shoulder radii of the cylinder are turned on a tracer-controlled engine lathe. In a milling operation, radii are machined on the ears of one of the forgings. Drilling follows, the work being supported in a heavy fixture. This set-up is made on a Fostick 6-foot radial drilling machine, shown in Fig. 2.

A fixture weighing over 2 tons is necessary to avoid distorting the cylinder, particularly since the fixture has to overhang the base of the machine. Also, the fixture is important in holding the 0.005-inch limit specified on center distances between holes on opposite ends of the cylinder. A torque wrench is employed in tightening the clamping nuts of the fixture so as to prevent any variations in the amount of pressure that is applied.

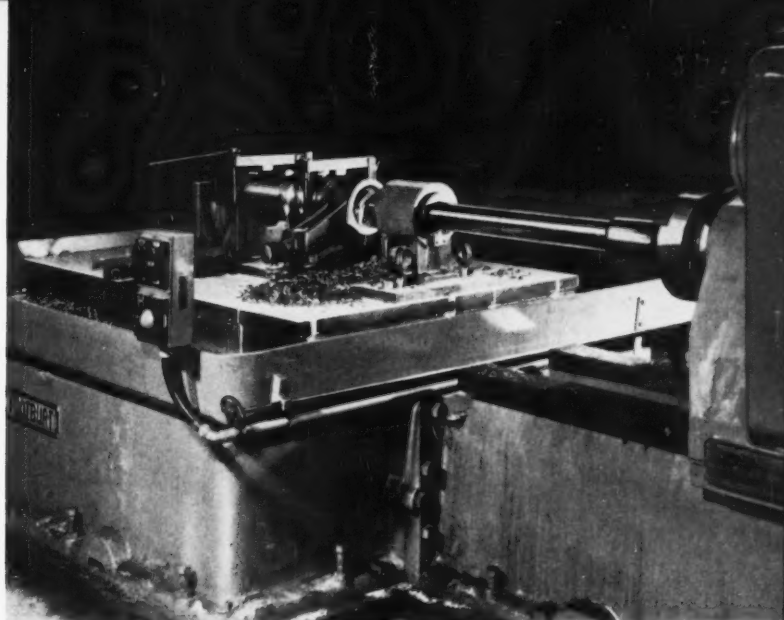
Another fixture, shown on a Hammond radial drilling machine in Fig. 3, holds the cylinder for drilling, reaming, counterboring, and tapping a hole in a small boss. An unusual feature of this fixture is its pivoting arm, which supports an air grinder used in finishing the face of the boss. Grinding is done manually with the wheel held horizontally and swung across the boss. Boss height is held within 0.01-inch limits. An r.m.s. finish of 40 micro-inches is required to insure a tight joint with a fitting subsequently assembled to the face.

A nose cylinder, having a pair of trunnions at one end, in its unmachined state is the heaviest forging in the landing gear, weighing approximately 465 pounds. Converting the solid forging to a tubular shape accounts for the greater part of its weight reduction to 115 pounds. Drilling the forging is performed on the special Footburt machine shown in Fig. 4, with the work clamped rigidly to a fixture bolted to the bed. A high-speed steel spade drill, 5 1/2 inches in diameter, feeds hydraulically and is piloted in a pillow bearing close to the bore. Coolant is fed through the drill and washes away chips as they are produced. Because of the toughness of the metal,



*Fig. 3. A pivoting arm permits a boss to be ground accurately while the work is still held in the drilling fixture.*

*Fig. 4. A pillow bearing positioned ahead of the work serves as support for a long spade drill on this special machine.*



a slow speed and feed are necessary, it requiring seventy-five minutes for the drill to reach its final depth of 27 1/4 inches.

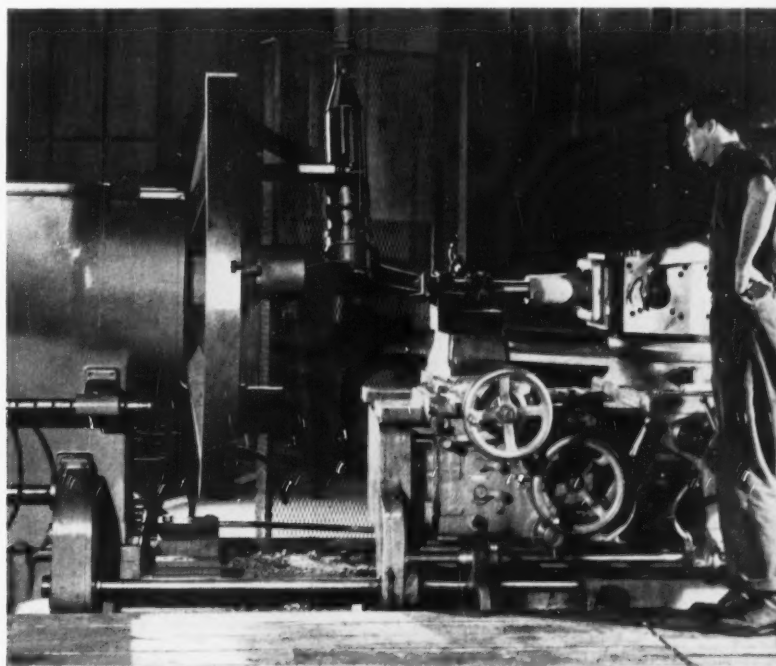
Various other operations follow: boring and reaming the inside diameter, forming the nose taper, heat-treating, Magnaflux testing, flange-facing, rough-grinding the outside diameter, and threading two areas in the bore with collapsible taps. The next operation, illustrated in Fig. 5, consists of machining the trunnions. As can be seen in the set-up, the work is held between centers on a 48-inch swing gap lathe, with the axis of the cylinder parallel to the faceplate, which is counterweighted. For safety, the area

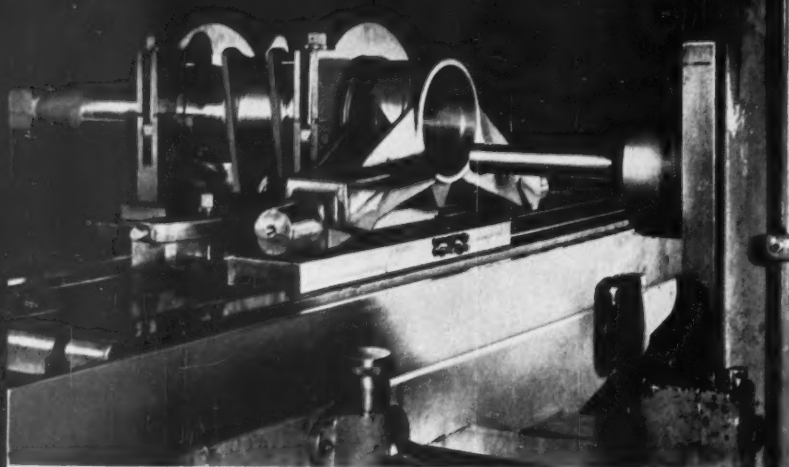
behind the work has been partitioned off by a cage of expanded-metal wire.

Specifications call for a keyway 1 1/16 inches long starting at a point 9 inches from the end of the bore. This operation, shown in Fig. 6, requires the use of a milling cutter supported on a special arbor that extends the necessary distance into the bore. The arbor body itself is stationary, with the cutter revolving on a pin fixed across a slot near one end. A small-diameter shaft running through the length of the arbor is connected to the spindle of the milling machine.

On the outer end of the shaft, which is offset

*Fig. 5. With the work held between centers, the trunnions are machined from the square turret.*





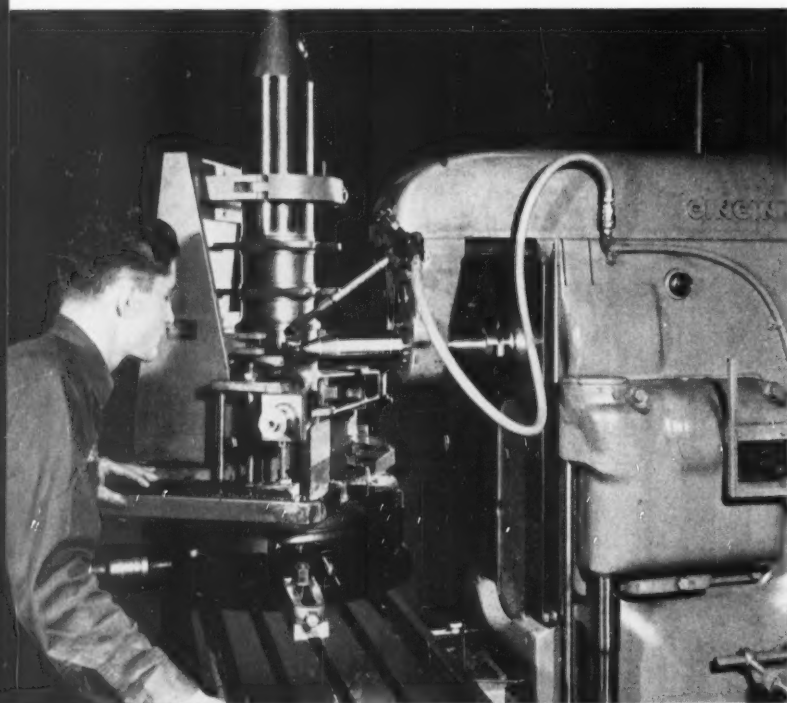
*Fig. 6. A cutter rotating in a slot in a special arbor machines a keyway as the saddle feeds the work into the cutter.*

in relation to the cutter, is a flange from which a series of pins project radially. These pins enter gashes between the cutter teeth, engaging them to drive the cutter without bearing on the cutting lips. Thus, the cutter rotates in a plane parallel to the axis of the arbor, and the saddle of the machine moves the work into the cutter during the feed stroke.

Other milling is done on external surfaces, some of which are cylindrical but lie between projections, and so cannot be turned on a lathe. In Fig. 7 is seen such an operation in progress.

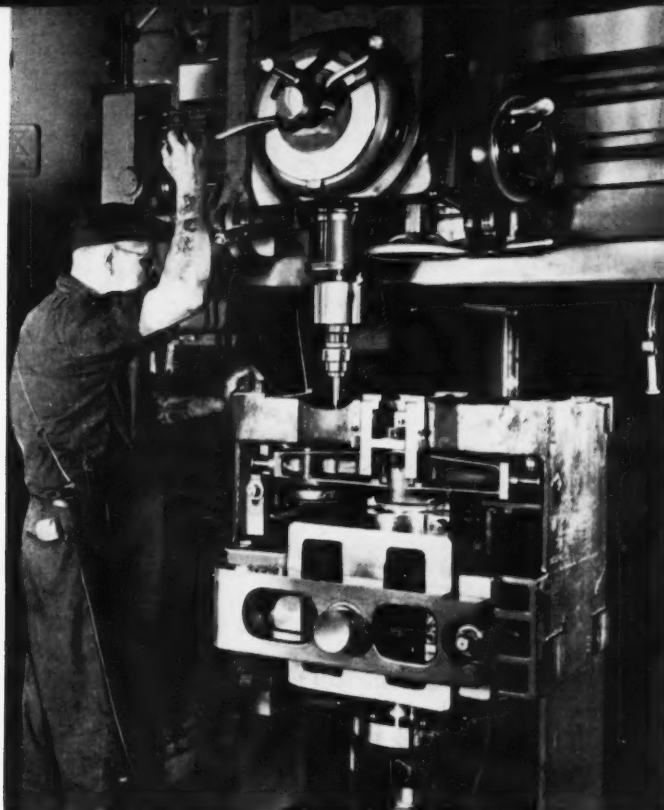
Here the work is mounted on a turntable and fed circularly to a small cutter. The periphery of the cutter blends into an adjacent radius which has been turned in a previous operation.

When all milling is completed, the nose forging is fitted into a heavy fixture, Fig. 8, where location is, in part, made from the trunnions. This fixture is mounted on a Fostick radial drilling machine, and is used for drilling and reaming a series of holes parallel to the cylinder bore. Subsequently, the fixture is positioned on other surfaces for drilling other holes.



*Fig. 7. Because of obstructions on the work surface, a milling machine replaces a lathe for this turning operation.*

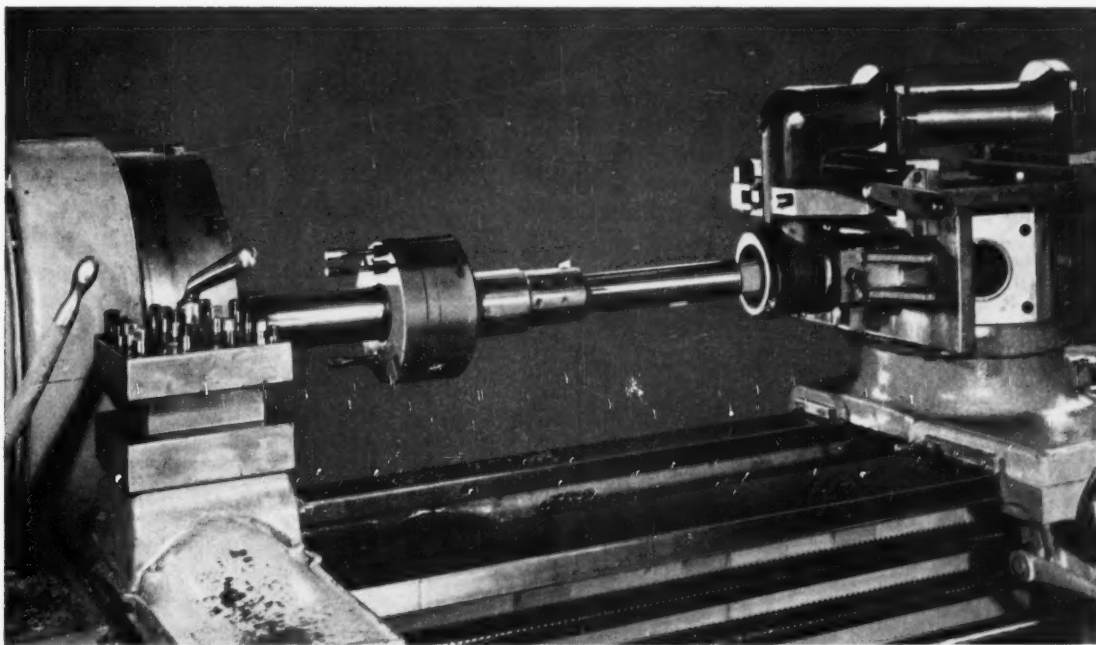
*Fig. 8. This heavy fixture holds the nose forging while a series of holes is drilled and reamed parallel to the cylinder bore.*



Another of the forgings, a U-shaped fork, undergoes a series of machining operations—one of them shown in Fig. 9 being somewhat unusual. Here, the work rather than the tool is mounted by means of a special angle fixture on

the hexagon turret of a Gisholt lathe. A 5-inch deep boring cut is taken by a tool supported in and rotated by the machine spindle. Because of the lack of open time on other equipment, the set-up proves to be expedient.

*Fig. 9. The normal relationship between the cutter and the work is reversed in this turret lathe set-up.*





# Approximating Arbitrary Ratios with Gears

By CHARLES A. PIPER  
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**I**N the set-up of machines to cut special gears, as well as in the design of mechanisms, it is frequently necessary to approximate an arbitrary ratio by using a limited number of gears. There are many methods available for determining a satisfactory combination of gears to provide such an approximation. Two methods have been found to be particularly useful and to provide advance knowledge of how accurate an approximation can be made when specific limitations are placed on the number of gears that can be used and on the number of teeth in the gears.

The case most frequently met in practice is that in which four gears are to be used, one on the driving shaft, one on the driven shaft, and two keyed to rotate together on an idler shaft, as shown in the illustration. If the tooth numbers are as indicated, the ratio of the speed of shaft (2) to that of shaft (1) is  $A/B \times C/D$ . Ordinarily, the numbers  $A, B, C, D$  are limited to the range from 20 to 120 teeth in change-gear sets.

## Corrector Method of Approximation

The first method of approximation to be outlined—hereafter referred to as the “corrector method”—involves selecting a ratio  $A/B$  which is close to the true value, and with a pair of correctors,  $C$  and  $D$ , differing by one tooth, bringing the compound ratio  $AC/BD$  within the desired limits. The use of correctors is based

on the fact that when both members of the pair  $C, D$  are increased (or decreased) by one tooth, the ratio  $C/D$  changes by only a small amount, permitting rather delicate adjustments to be made. Thus,

$$\frac{100}{99} = 1.010101$$

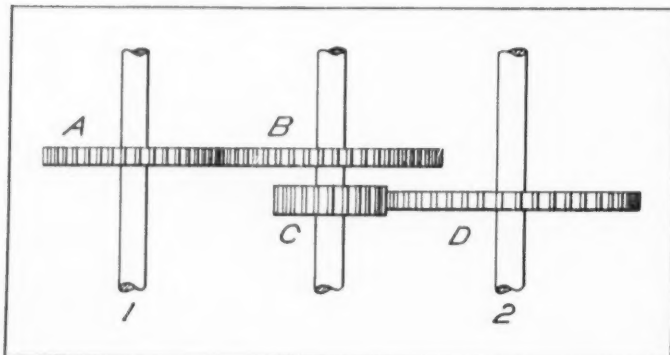
$$\frac{100+1}{99+1} = \frac{101}{100} = 1.010000$$

$$\text{Difference} = 0.000101$$

In the practical application of the method, a pair of gears  $A, B$  is selected whose ratio  $A/B$  is as nearly as possible 1 per cent smaller (or larger) than the desired ratio, assuming that correctors up to about 120 teeth are available. This may be done either by reference to tables of ratios or by direct expansion of the modified ratio into continued fractions, as outlined later. In either case, the resulting approximate ratio is divided into the desired final ratio, giving as a quotient the required correction. The corrector pair is selected either by reference to a table such as Table 1 or by direct expansion into continued fractions.

*Example*—The desired ratio is 0.4312865  
less 1 per cent 0.0043129

Adjusted trial value = 0.4269736  
= 38/39, nearly.



The most common type of change-gear arrangement employs four gears, as shown.

The ratio 38/39 is used as the first pair. The ratio of the corrector pair is

$$0.4312865 \times \frac{89}{38} = 1.01012$$

$$= 1 + \frac{1}{99} = \frac{100}{99}, \text{ nearly.}$$

Therefore the final set of gears is

$$\frac{38}{89} \times \frac{100}{99} = 0.431279$$

for an error of 1 part in 50,000, approximately. This is about the average error for this type of approximation, the maximum error being about 1/20,000.

### General Method of Approximation

The second method of approximation, which permits the *best possible* approximation with a given number of gears of stated maximum tooth numbers, is dependent upon some of the properties of continued fractions.

A continued fraction is one in which the denominator has been modified by the addition of a fraction whose denominator has, in turn, been modified, etc.

Example—

$$1 + \frac{1}{2 + \frac{1}{5 + \frac{1}{7 + \frac{1}{3 + \frac{1}{2 + \frac{1}{5}}}}}}$$

This is usually written, for compactness,

$$\frac{1}{2 + \frac{1}{5 + \frac{1}{7 + \frac{1}{3 + \frac{1}{2 + \frac{1}{5}}}}}}$$

(Note that the plus signs are in line with the denominators, not with the fraction lines!) It is not necessary, in general, for a continued fraction to have all its numerators unity or all its arithmetic signs positive, but this basic type is the only one which is of concern here.

If a continued fraction is truncated at any point and the total value computed, this value is known as a *convergent*. The first few convergents for the above continued fraction are

$$\frac{1}{2}, \frac{5}{7}, \frac{36}{79}, \frac{113}{248}$$

It is not necessary to compute each convergent by working laboriously from right to left; instead, what is called a *recursion* relation should be used. To get the numerator of the next convergent, multiply the present numerator by the denominator of the next continued fraction term, and add the numerator of the previous convergent. The same procedure applies to the denomi-

**Table 1. Two-Gear Correctors that May be Used to Modify a Ratio A/B and Thus Obtain a Close Approximation to an Arbitrary Ratio**

| $n$ | $\frac{n}{n-1}$ | $n$ | $\frac{n}{n-1}$ |
|-----|-----------------|-----|-----------------|
| 71  | 1.014286        | 96  | 1.010526        |
| 72  | 085             | 97  | 417             |
| 73  | 1.013889        | 98  | 309             |
| 74  | 699             | 99  | 204             |
| 75  | 514             | 100 | 101             |
| 76  | 333             | 101 | 000             |
| 77  | 158             | 102 | 1.009901        |
| 78  | 1.012987        | 103 | 804             |
| 79  | 821             | 104 | 709             |
| 80  | 658             | 105 | 615             |
| 81  | 500             | 106 | 524             |
| 82  | 346             | 107 | 434             |
| 83  | 195             | 108 | 346             |
| 84  | 048             | 109 | 259             |
| 85  | 1.011905        | 110 | 174             |
| 86  | 765             | 111 | 091             |
| 87  | 628             | 112 | 009             |
| 88  | 494             | 113 | 1.008929        |
| 89  | 364             | 114 | 850             |
| 90  | 236             | 115 | 772             |
| 91  | 111             | 116 | 696             |
| 92  | 1.010989        | 117 | 621             |
| 93  | 870             | 118 | 547             |
| 94  | 753             | 119 | 475             |
| 95  | 638             | 120 | 403             |

nators. In the example given, the next convergent after 5/11 is

$$\frac{5 \times 7 + 1}{11 \times 7 + 2} = \frac{36}{79}$$

Similarly, for the following convergent

$$\frac{36 \times 3 + 5}{79 \times 3 + 11} = \frac{113}{248}$$

The construction of a continued fraction will be demonstrated by expanding

$$\frac{1423}{3123}$$

into a continued fraction:

$$\begin{array}{r} 1423 \overline{) 3123} \quad (2 \\ \underline{2816} \phantom{00} \\ 277 \phantom{00} \overline{) 1423} \quad (5 \\ \underline{1385} \phantom{00} \\ 38 \phantom{00} \overline{) 277} \quad (7 \\ \underline{266} \phantom{00} \\ 11 \phantom{00} \overline{) 38} \quad (3 \\ \underline{33} \phantom{00} \\ 5 \phantom{00} \overline{) 11} \quad (2 \\ \underline{10} \phantom{00} \\ 1 \phantom{00} \overline{) 5} \quad (5 \\ \underline{5} \phantom{00} \\ 0 \end{array}$$

Therefore,  $\frac{1423}{3123} = \frac{1}{2 + \frac{1}{5 + \frac{1}{7 + \frac{1}{3 + \frac{1}{2 + \frac{1}{5}}}}}}$

If the given number is a decimal fraction, it should be converted into a common or vulgar fraction, for instance

$$0.3183 = \frac{3183}{10,000} \text{ and then handled as above.}$$

Continued fractions have some other interesting properties:

1. Each convergent is closer to the true value of the quantity being expanded than any other fraction not having a larger denominator.
2. The fractional error in the approximation is of the order of 1 divided by the square of the denominator of the convergent.
3. Each convergent is a fraction in its lowest terms.
4. Successive convergents alternate in value about the true quantity being expanded, providing all terms of the expansion have the same arithmetic sign.

The second method of approximating an arbitrary ratio—hereafter referred to as the “general method”—is based on the following ideas. Expressing an arbitrary value by a set of gear ratios amounts to replacing it by a rational fraction. The numerator of this fraction is the product of the tooth numbers of all the driver gears, and the denominator, that of the driven gears. Usually there will be a limitation on how many gears can be in the train and on how many teeth can be in any one gear. This, in turn, limits the maximum value that the numerator or denominator of the rational fraction can have.

For example, if two pairs of gears are allowed, each gear having not more than 120 teeth, neither numerator nor denominator of the fraction representing the total gear ratio can be greater than  $14,400 = (120)^2$ . The closest possible rational fraction to the desired value, which at the same time does not violate the criterion for numerator and denominator size, will be the de-

sired gear ratio. In general, this will not be factorable into suitable size numbers. It may thus be necessary to look to the second best, third best, etc., rational fraction until one is found which can be suitably factored. The first fraction found to be factorable into usable factors will be the best possible approximation that can be made to the desired number, subject to the given limitations. The general method consists, therefore, of finding the first few rational fractions best approximating the desired value and examining them for factors, beginning with the most nearly accurate and proceeding toward less accurate ones.

The desired value, expressed to about eight decimal places if possible, should be expanded as a continued fraction, and successive convergents computed until the numerator or denominator of the convergent exceeds the maximum usable value—for example, 14,400 for the case of two pairs of gears of not more than 120 teeth. The various approximate rational fractions which are closest to the best one are arrived at by making small changes in the last term or two of the continued fraction expansion representing the best usable value. One of the easiest ways of organizing this procedure is to combine the two or three final terms of the continued fraction into a single one. This single term, of course, will no longer have a unit numerator. For example, taking the same ratio as before,

$$\frac{1423}{3123} = \frac{1}{2} + \frac{1}{5} + \frac{1}{7} + \frac{1}{3} + \frac{1}{2} + \frac{1}{5}$$

which may be written  $\frac{1}{2} + \frac{1}{5} + \frac{1}{7} + \frac{11}{38}$

where  $\frac{1}{3} + \frac{1}{2} + \frac{1}{5} = \frac{11}{38}$

At this point it is necessary to introduce a new recursion formula to take care of terms like the  $11/38$ . The procedure is as follows: In order to get the numerator of the next convergent, multiply the numerator of the present convergent by the denominator of the next continued fraction term and add the numerator of the previous convergent multiplied by the numerator of the continued fraction term. Similarly, the denominator of the new convergent is formed from the present and previous denominators, which are multiplied by the denominator and numerator, respectively, of the new fraction term. Consider, for example, the second and third convergents for the continued fraction above. As previously calculated, these are  $5/11$  and  $36/79$ . The new convergent including the term  $11/38$  is

$$\frac{36 \times 38 + 5 \times 11}{79 \times 38 + 11 \times 11} = \frac{1423}{3123}$$

which corresponds to the original fraction.

**Table 2. Progressively Smaller and Larger Values of the Ratio  $P/Q$  and Corresponding Approximations to the Ratio  $1423/3123$**

| Progressively Smaller Values of the Ratio $P/Q$ and Corresponding Approximations |                              |               |
|--|------------------------------|---------------|
| $P/Q$  | $\frac{36Q + 5P}{79Q + 11P}$ | Decimal Value |
| 11/38  | 1423/3123                    | = 0.4556516   |
| 2/7  | 262/575                      | = 0.4556522   |
| 9/32   | 1197/2627                    | = 0.4556528   |
| 7/25   | 935/2052                     | = 0.4556530   |
| 5/18   | 673/1477                     | = 0.4556534   |
| 8/29   | 1084/2379                    | = 0.4556536   |
| Progressively Larger Values of the Ratio $P/Q$ and Corresponding Approximations  |                              |               |
| $P/Q$  | $\frac{36Q + 5P}{79Q + 11P}$ | Decimal Value |
| 11/38  | 1423/3123                    | = 0.4556516   |
| 9/31   | 1161/2548                    | = 0.4556515   |
| 7/24   | 899/1973                     | = 0.4556513   |
| 5/17   | 637/1398                     | = 0.4556509   |
| 8/27   | 1012/2221                    | = 0.4556506   |
| 3/10   | 375/823                      | = 0.4556501   |

The question now arises: What other fractions are very close in value to 1423/3123 and have denominators not exceeding, say, 3000? If 11/38 is replaced by some other value  $P/Q$ , the new convergent value will be

$$\frac{36Q + 5P}{79Q + 11P}$$

where the denominator  $79Q + 11P$  must not exceed 3000, or, roughly speaking,  $Q$  must not exceed about 36. With the help of a table of ratios,\* compile two sets of columns consisting (as shown in Table 2) of the fractions successively less than 11/38 having denominators not greater than 36, and the fractions successively greater than 11/38 satisfying the same criterion. These fractions when combined with the previous convergent 36/79 give the rational fraction approximations most nearly equal to 1423/3123 and having denominators not exceeding 3000. The more the added term differs from 11/38, the more the total fraction will differ from 1423/3123.

If the last two terms of the original continued fraction instead of the last three had been combined, the value of the combined term would have been 5/11. The other fractions near in value to 5/11 would have been as indicated in the top row of Table 3. The second row of Table 3 shows the effect of combining each of these fractions with 1/3, which is the preceding term of the original continued fraction. These are the same values appearing in the first column of Table 2 and therefore produce the same approximation as shown in the second column of Table 2. The same set of rational fraction approximations to the desired quantity would be obtained irrespective of where the continued fraction is terminated for the final step in the approximation! It is important to note that this method overlooks no rational fraction close to the desired value and thus is certain to produce the best answer.

The only work remaining then is to factor the numerator and denominator of the fraction into usable size numbers and specify the gear train.

### Application of the General Method

Two numerical examples will be worked out to show how the method is applied in the usual case and one example to show a difficult case

**Table 3. Combining Last Two Terms of Continued Fraction Representing 1423/3123 Produces Same Result as when Last Three Terms are Combined as in Table 2**

| $P/Q$                       | 1  | 3  | 2  | 3  | 4  | 5  | 1 | 5  | 4  | 3  | 5  |
|-----------------------------|----|----|----|----|----|----|---|----|----|----|----|
|                             | 3  | 8  | 5  | 7  | 9  | 11 | 2 | 9  | 7  | 5  | 8  |
| $\frac{1}{3} + \frac{P}{Q}$ | 3  | 8  | 5  | 7  | 9  | 11 | 2 | 9  | 7  | 5  | 8  |
|                             | 10 | 27 | 17 | 24 | 31 | 38 | 7 | 32 | 25 | 18 | 29 |

where a large number of fractions were tried before one was found which could be factored.

**Example 1**—Find the best possible approximation to the ratio 0.863900 using not more than four gears of not less than 20 nor more than 120 teeth. The ratio is first converted into a continued fraction

$$0.863900 = \frac{1}{1 + \frac{1}{6 + \frac{1}{2 + \frac{1}{1 + \frac{1}{7 + \frac{1}{6 + \frac{1}{2 + \frac{1}{4}}}}}}}}$$

The convergents to this continued fraction are

$$\frac{1}{1}, \frac{6}{7}, \frac{13}{15}, \frac{19}{22}, \frac{146}{169}, \frac{895}{1036}, \frac{1936}{2241}, \frac{8639}{10,000}$$

For convenience in dealing with the fractions, the expression is rewritten as follows:

$$0.863900 = \left[ \frac{146}{169}, \frac{895}{1036} \right] + \frac{4}{9} \text{ where } \frac{895}{1036}$$

the sixth convergent, has a denominator about ten times smaller than the maximum allowable (14,400) and 4/9 is the combined value of the last two terms of the expansion. The problem is now reduced to the following: what values  $P/Q$  may be used to replace 4/9 to give a total fraction whose denominator does not exceed 14,400 and which is factorable into convenient size numbers? Using the recursion formula,

$$\left[ \frac{146}{169}, \frac{895}{1036} \right] + \frac{P}{Q} = \frac{895Q + 146P}{1036Q + 169P} = \frac{M}{N} \text{ say.}$$

By inspection it is seen that if the denominator is not to exceed 14,400,  $Q$  must not exceed about 13. Next, refer to a table which lists rational fractions, and set out in the first column of a table such as Table 4 those fractions closest in value to 4/9 but with denominators not exceeding 13. In a second column set out the resulting combined fractions  $M/N$ . The third and fourth columns contain the factors, if any, and the decimal equivalent of the nearest useful value. It is recommended that the computations be performed in the order indicated by the numbers in the last column of the table, terminating the operation when the first satisfactory value has been found. If any doubt exists as to whether there is a usable value on the other side of the nominal which is closer to the desired

\* Such tables of ratios may be found in *Manual of Gear Design*, Earle Buckingham, The Industrial Press, New York, 1937. *MACHINERY'S HANDBOOK*, The Industrial Press, New York. *Formulas in Gearing*, C. S. Stutz, Brown & Sharpe Mfg. Co., Providence, R. I., 1939. *14000 Gear Ratios*, R. M. Page, The Industrial Press, New York, 1942.



**Table 4. Approximations to the Ratio 0.863900 Obtained by Using Fractions with Denominators Smaller than 14,400**

| $P/Q$ | $\frac{895Q+146P}{1036Q+169P}$ | Factors   | Decimal Value |     |
|-------|--------------------------------|---|---------------|-----|
| 2/5   | 4767/5518                      | $3 \times 7 \times 227 / 2 \times 31 \times 89$           |               | (5) |
| 5/12  | 11470/13277                    | $2 \times 5 \times 31 \times 37 / 11 \times 17 \times 71$ |               | (3) |
| 3/7   | 6703/7759                      | 6703/7759   |               | (1) |
| 4/9   | 8639/10000                     | Exact Value   | 0.86390000    |     |
| 5/11  | 10575/12241                    | $3^2 \times 5^2 \times 47 / 12241$                        |               | (2) |
| 6/13  | 12511/14482                    | Denominator too large                                     |               | (4) |
| 1/2   | 1936/2241                      | $2^4 \times 11^2 / 3^2 \times 83$                         | 0.86390004    | (6) |

value than the one first found, the decimal values may be checked by division. This value 0.86390004 is the best value that can be secured with four gears subject to the given conditions.

**Example 2**—Find the best approximation for the ratio 3.48592 using not more than four gears of not less than 20 and not more than 120 teeth. The continued fraction representing 3.48592 is

$$3.48592 = 3 + \frac{1}{2 + \frac{1}{17 + \frac{1}{3 + \frac{1}{1 + \frac{1}{10 + \frac{1}{4}}}}}}$$

The convergents to this continued fraction are

$$3, \frac{7}{2}, \frac{122}{35}, \frac{373}{107}, \frac{495}{142}, \frac{5323}{1527}, \frac{21787}{6250}$$

They may be written as

$$3.48592 = \left[ \frac{373}{107}, \frac{495}{142} \right] + \frac{4}{41}$$

Next, 4/41 is replaced by  $P/Q$  where  $Q$  may have values up to about 26 if the numerator of the final fraction is not to exceed 14,400. Table 5 is constructed as before for values of  $P/Q$  near to 4/41.

The best answer subject to the given limitations is  $2^3 \times 23 \times 37 / 3^2 \times 7 \times 31$  for an error of 0.0000009.

**Example 3**—Determine a gear ratio as close as possible to 0.734800 using four gears having between 20 and 120 teeth.

$$0.734800 = \frac{1}{1 + \frac{1}{2 + \frac{1}{1 + \frac{1}{3 + \frac{1}{2 + \frac{1}{1 + \frac{1}{3 + \frac{1}{4 + \frac{1}{3}}}}}}}}}$$

Convergents:

$$1, \frac{2}{3}, \frac{3}{4}, \frac{11}{15}, \frac{25}{34}, \frac{36}{49}, \frac{133}{181}, \frac{568}{773}, \frac{1837}{2500}$$

For making the computation this is written as

$$0.734800 = \left[ \frac{133}{181}, \frac{568}{773} \right] + \frac{1}{3} = \left[ \frac{133}{181}, \frac{568}{773} \right] + \frac{P}{Q} = \frac{M}{N}$$

It is apparent that  $Q$  must not exceed about 18. The value at the foot of the left column of Table 6 is the first one found which yields suitable factors

$$\frac{3239}{4408} = \frac{41 \times 79}{2^3 \times 19 \times 29} = \frac{41}{58} \times \frac{79}{76} = 0.73480036$$

for an error of 0.00000036.

Note that fifty rational fractions closest in value to 0.734800 were tried before one was

**Table 5. Approximations to the Ratio 3.48592 Obtained by Using Fractions with Denominators Smaller than 14,400**

| $P/Q$ | $\frac{495Q+373P}{142Q+107P}$ | Factors  | Decimal Value |      |
|-------|-------------------------------|--|---------------|------|
| 1/13  | 6808/1953                     | $2^3 \times 23 \times 37 / 3^2 \times 7 \times 31$ | 3.4859191     | (12) |
| 2/25  | 13121/3764                    | $13121 / 2^2 \times 941$                           |               | (10) |
| 1/12  | 6313/1811                     | $59 \times 107 / 1811$                             |               | (8)  |
| 2/23  | 12131/3480                    | $7 \times 1733 / 2^3 \times 5 \times 5 \times 29$  |               | (6)  |
| 1/11  | 5818/1669                     | $2 \times 2909 / 1669$                             |               | (4)  |
| 2/21  | 11141/3196                    | $13 \times 857 / 2^2 \times 17 \times 47$          |               | (2)  |
| 4/41  | Exact Value                   |  | 3.4859200     |      |
| 1/10  | 5323/1527                     | $5323 / 3 \times 509$                              |               | (1)  |
| 2/19  | 10151/2912                    | $10151 / 2^3 \times 7 \times 13$                   |               | (3)  |
| 1/9   | 4828/1385                     | $2^2 \times 17 \times 71 / 5 \times 277$           |               | (5)  |
| 3/26  | 13989/4013                    | $3 \times 4663 / 4013$                             |               | (7)  |
| 2/17  | 9161/2628                     | $9161 / 2^2 \times 3^2 \times 73$                  |               | (9)  |
| 3/25  | 13494/3871                    | $2 \times 3 \times 13 \times 173 / 7^2 \times 79$  |               | (11) |

found that could be suitably factored. This raises a question as to just how many of the numbers between 0 and 14,400 can be broken into two factors each not greater than 120. Table 7 shows

**Table 6. Progressively Larger and Smaller Values of  $P/Q$  and Corresponding Approximations  $M/N$  to the Ratio 0.734800**

| $P/Q$ Increasing from 1/3 |             | $P/Q$ Decreasing from 1/3 |             |
|---------------------------|-------------|---------------------------|-------------|
| $P/Q$                     | $M/N$       | $P/Q$                     | $M/N$       |
| 6/17                      | 10454/14227 | 5/16                      | 9753/13273  |
| 5/14                      | 8617/11727  | 4/13                      | 7916/10773  |
| 4/11                      | 6780/9227   | 3/10                      | 6079/8273   |
| 3/8                       | 4943/6727   | 5/17                      | 10321/14046 |
| 5/13                      | 8049/10954  | 2/7                       | 4242/5773   |
| 7/18                      | 11155/15181 | 5/18                      | 10889/14819 |
| 2/5                       | 3106/4227   | 3/11                      | 6647/9046   |
| 5/12                      | 7481/10181  | 4/15                      | 9052/12319  |
| 3/7                       | 4375/5954   | 1/4                       | 2405/3273   |
| 7/16                      | 10019/13635 | 3/13                      | 7783/10592  |
| 4/9                       | 5644/7687   | 2/9                       | 5378/7319   |
| 5/11                      | 6913/9408   | 3/14                      | 8351/11365  |
| 6/13                      | 8182/11135  | 1/5                       | 2973/4046   |
| 7/15                      | 9451/12862  | 2/11                      | 6514/8865   |
| 8/17                      | 10720/14859 | 3/17                      | 10055/13684 |
| 1/2                       | 1269/1727   | 1/6                       | 3541/4819   |
| 9/17                      | 10853/14770 | 2/13                      | 7650/10411  |
| 8/15                      | 9584/13043  | 1/7                       | 4109/5592   |
| 7/13                      | 8315/11316  | 2/15                      | 8786/11957  |
| 6/11                      | 7046/9589   | 1/8                       | 4677/6365   |
| 5/9                       | 5777/7862   | 2/17                      | 9922/13503  |
| 9/16                      | 10285/13997 | 1/9                       | 5245/7138   |
| 4/7                       | 4508/6135   | 1/10                      | 5813/7911   |
| 7/12                      | 7747/10543  | 1/11                      | 6381/8684   |
| 3/5                       | 3239/4408   | 1/12                      | 6949/9457   |
|                           |             | 1/13                      | 7517/10230  |
|                           |             | 1/14                      | 8085/11003  |

**Table 7. Distribution of Numbers having Two Factors, and Those having Three Factors, Each Factor being Less than 120**

| Range            | Number of Numbers in Range having Two Factors Each Less than 120 | Number of Numbers in Range having Three or More Factors Each Less than 120 |
|------------------|--|--|
| 501 to 600       | 64   | ...  |
| 1001 to 1100     | 57   | ...  |
| 2001 to 2100     | 48   | ...  |
| 4001 to 4100     | 41   | ...  |
| 8001 to 8100     | 28   | 5  |
| 10,101 to 10,200 | 15   | 17   |
| 14,301 to 14,400 | 1  | 22   |

how many such numbers out of one hundred are found in various parts of the spectrum. The third column shows how many additional numbers of the hundred can be broken into three or more factors not greater than 120.

It is apparent from this table that there is going to be difficulty in finding a fraction with suitable factors for constructing a four-gear train if the numerator or the denominator is allowed to be much greater than 6000 to 8000. In the above example of the perversity of numbers, if denominators had been limited to 6000, nine trials would have yielded the same fraction found when the best possible one was being sought. It is therefore recommended that numerators and denominators be limited in size if the best possible value is not required.

## Giant Stretcher will Straighten Extrusions

**A**IRCRAFT parts of the future will literally be pulled into shape with the 3,000,000-pound pull of a new "stretcher" that is now being erected at the Aluminum Company of America's Lafayette, Ind., Works. The stretcher, owned by Alcoa, will straighten and relieve strain in large aluminum extruded parts. The parts will be made on huge extrusion presses.

The stretcher will be about 180 feet long and 5 feet wide with a total weight of approximately 2,100,000 pounds. It will be capable of handling pieces of metal up to 110 feet in length, and of straightening shapes up to 60 square inches in cross-sectional area in one of the strongest aircraft alloys, 75S.

Extra safety allowances had to be built into the stretcher, for if a piece of metal should break while under maximum tension it could fly off at 1900 inches per second—or better than 100 miles an hour. During the stretching, 17,000,000

inch-pounds of kinetic energy is stored up in the piece of metal. This tremendous force had to be absorbed in the stretcher itself in case of a break.

During the extruding process, large pieces of aluminum have a tendency to warp or curve, and as a result internal strains are built up. To guarantee freedom from these residual strains and to straighten the extruded part, the strains and warps must be removed. This is done by putting the extruded part into a stretcher and, in a single operation, overcoming these difficulties. During the stretching operation, the pull on the machine is so great that the stretcher column may shorten as much as 3/8 inch.

The stretcher is mounted on a foundation of 1500 cubic yards of concrete that has 23 tons of steel reinforcing bars and 12 tons of steel floor plate. Aluminum tread bridge sections are used for walks.

# Automation in Broaching

By ARVID LUNDELL, President  
Colonial Broach Co.  
Detroit, Mich.

**A**UTOMATION—the replacing of manual effort by semi-automatic and automatic devices—is being increasingly applied to broaching equipment made by the Colonial Broach Co., Detroit, Mich. Objectives of automation in broaching, as in all forms of machining, are (1) decreasing floor-to-floor time per part and increasing output per machine-hour; (2) reducing manual labor required in handling the work and tools; and (3) reducing production costs.

In general, broaching equipment is somewhat more difficult to automatize than other types of machines, but at the same time the net gains are more pronounced. These apparently contradictory facts stem from a single factor. By nature, the broaching process is extremely fast and actual machining time short. There are few oper-

ations in a production line, either preceding or following a broaching operation, which can normally keep pace with the productivity of a broaching machine. As a result, it is not usually economical to tie a broaching operation into a complete transfer line. The inevitable result of such a practice would be to reduce the effective productivity of the broaching machine to that of other machines and processes in the transfer line.

In contrast, however, the loading and unloading time for a broaching machine does represent a high proportion of the total machine cycle time. Therefore, any reduction in materials-handling that can be achieved through automation devices will tend to increase the over-all productivity of the average broaching machine more than it would increase the productivity of most other types of equipment.

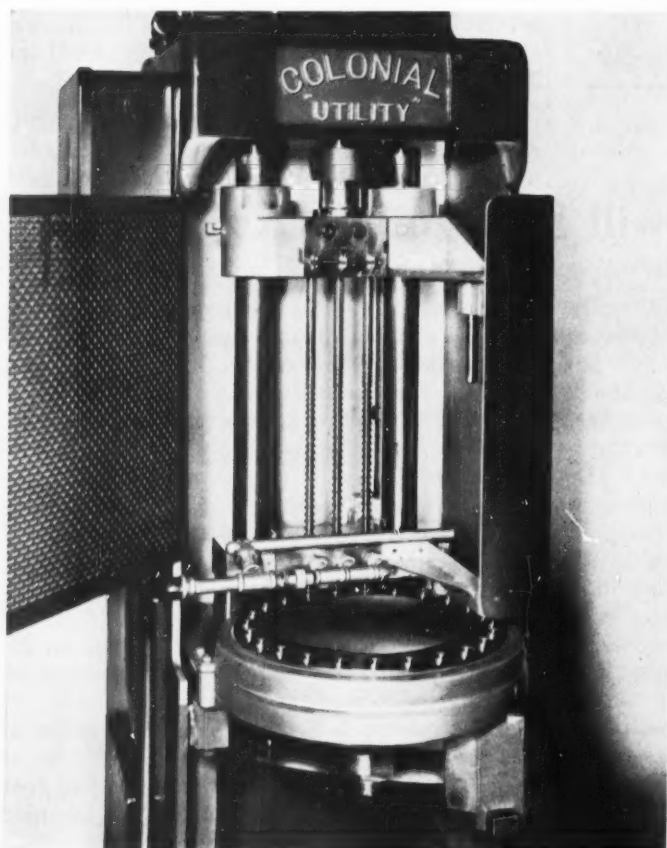


Fig. 1. Machine equipped with three broaches and a rotary indexing table permits broaching of three bushings at a time.

**Fig. 2. Automatic positioning is obtained by means of a shuttle which transfers work-pieces into broaching position from magazines.**

Principal uses of semi-automatic and automatic devices to provide automation in broaching processes take place in connection with:

1. Supplying the work to the machine;
2. Positioning the work on the machine;
3. Removing the work from the machine;
4. Reducing the amount of manual broach handling required.

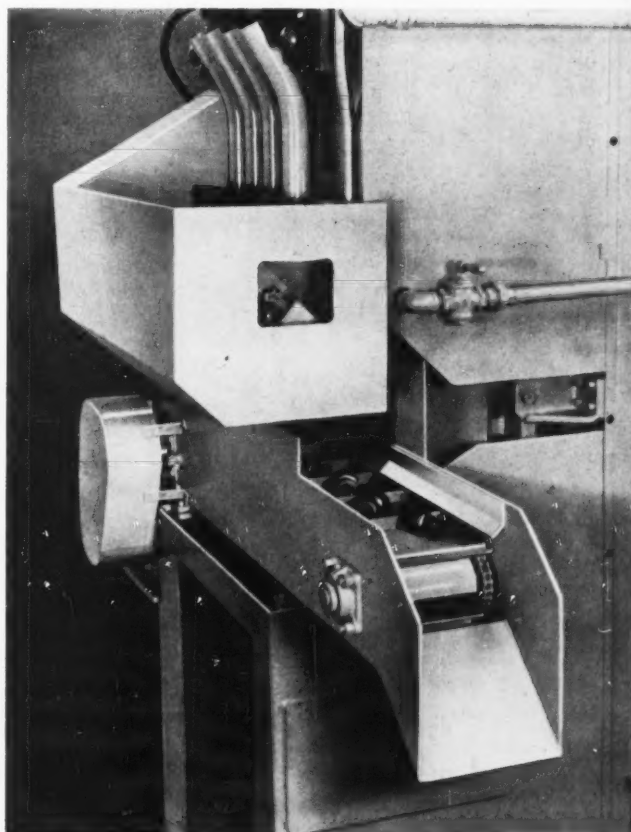
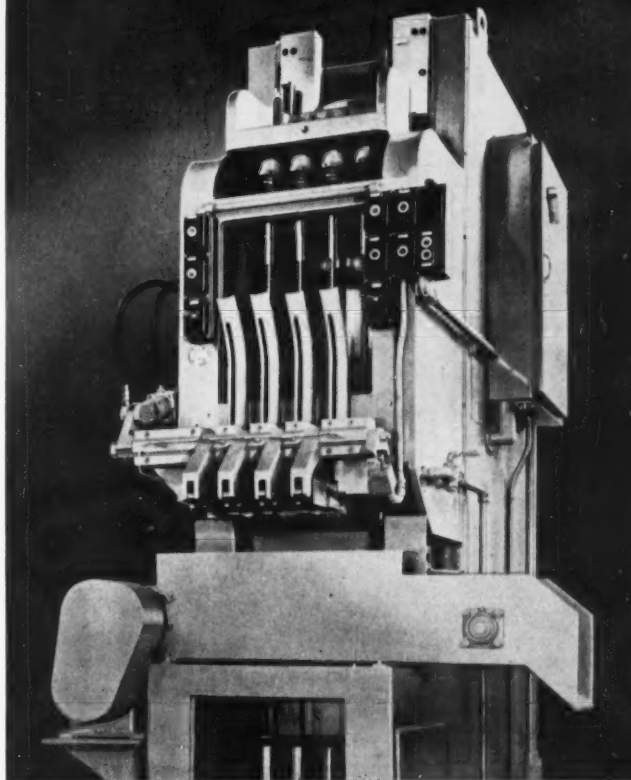
Examples in each of these categories will be described in this article. They illustrate the manner in which various types of automation devices have been used effectively to decrease manual effort and increase output in different kinds of broaching equipment.

Three bushings are broached at one time in continuous production with the set-up seen in Fig. 1, using three broaches and a rotary type table. After each broaching pass, the table automatically indexes. Loading is semi-automatic, since the operator merely drops the bushings in place as the table indexes past him. Machine operation is continuous, and there is no time lost in loading. When the broached bushings are indexed past the work position, they fall through an opening in the base of the rotary fixture, and on a chute which carries them out of the machine and into a stock bin.

Rotary indexing fixtures provide one of the simplest methods of automatically positioning work for some forms of broaching. The table is tied in with the action of the broaches so that, after the broaches are returned, a set of three more bushings is automatically brought into position for broaching. Though simple, this method is extremely fast, especially when push broaching is used.

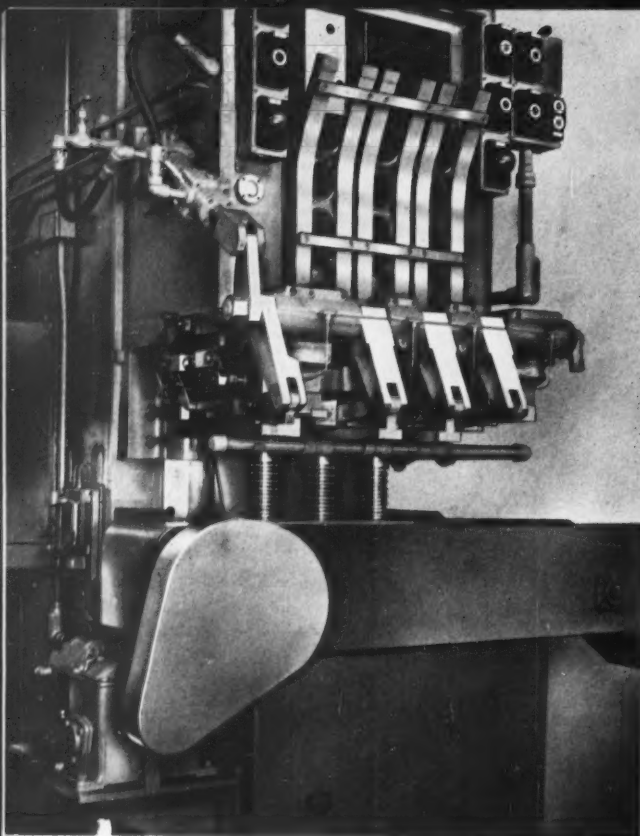
Another method of obtaining semi-automatic loading in broaching is illustrated in Fig. 2. Here four magazines are used to supply small steel forgings to four broaches through an automatic shuttle. The magazines are designed so that only the proper ends of the parts can be loaded first, and are slotted to permit the operator to see when reloading is necessary. The operator is only required to keep the magazines loaded, as the machine otherwise is fully automatic and runs continuously.

The shuttle transfers the steel forgings to the four broaching stations from the four magazines. As the spline broaches are pulled up through the



**Fig. 3. Endless conveyor removes finished parts from the broaching machine seen in Fig. 2. Separators on conveyor prevent piling up of work.**





**Fig. 4.** In this set-up, a shuttle takes a part from each of three magazines, and locates the parts above the three pull broaches.

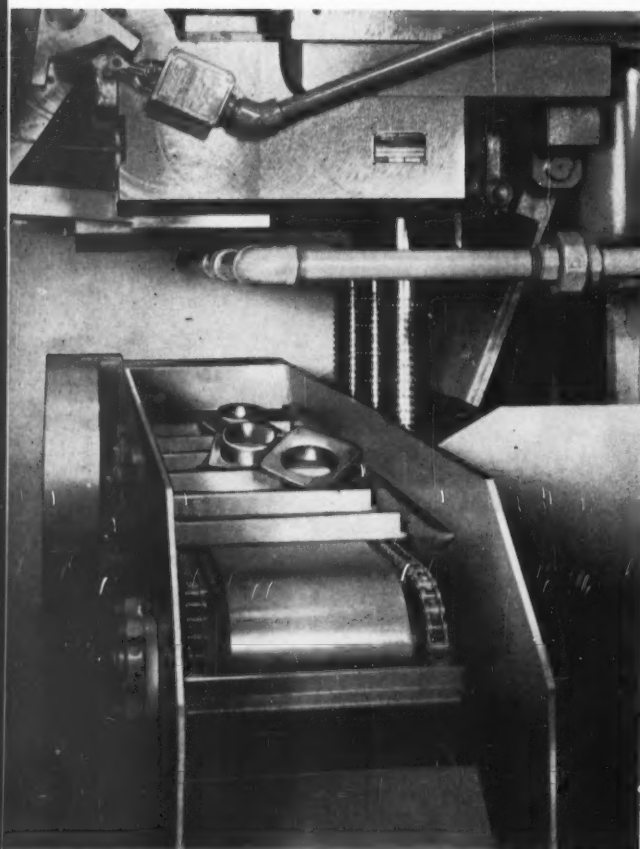
work, the hydraulically operated shuttle returns to the magazines for another set of four work-pieces. Production rate is 800 precision-broached spline parts per hour. Since each forging has seventeen internal splines, the machine produces 13,600 splines per hour.

An automatic conveyor, Fig. 3, is provided to remove the finished broached parts from the machine. Parts, broached four at a time, fall off the broaches at the completion of the stroke, are deflected by a swinging baffle, and drop on the endless conveyor. Separators on the conveyor eliminate the possibility of the work-pieces piling up. A minimum of operator time and effort is required.

Another vertical broaching machine equipped with a magazine feed is shown in Fig. 4. In this installation, three magazine type loaders feed the parts to a shuttle for positioning over the broaches. The magazines have open faces, making it possible to tell at a glance when reloading is necessary. As the magazine must be loaded by the operator, this operation is classified as semi-automatic. The shuttle takes three parts at a time (one from each magazine), and locates them above the three pull broaches. An automatic broach handling mechanism then engages the broaches and pulls them through the parts. Meanwhile, the shuttle returns to the magazine feeders for another set of parts.

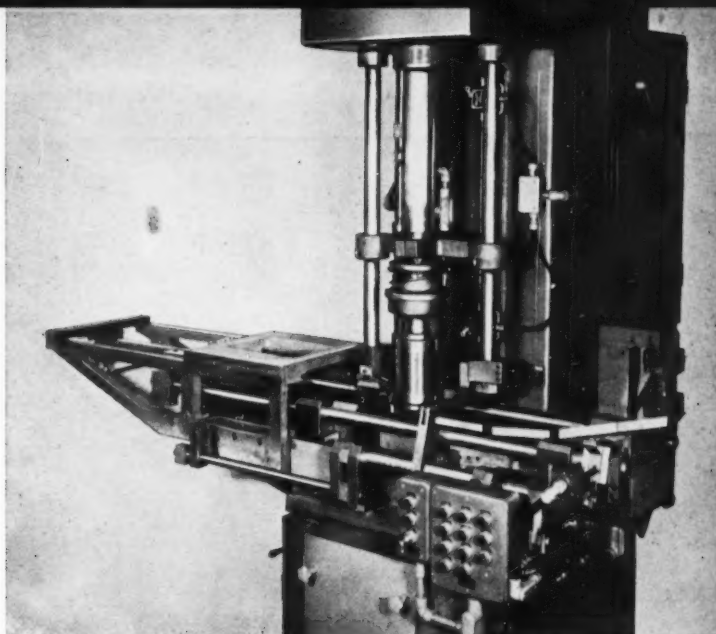
The automatic method of ejecting completed parts from this vertical pull type broaching machine is illustrated in Fig. 5. When the broaches are pulled through the work, the finished parts drop off the broach ends. They are deflected by a baffle (seen at the upper right), which swings into place automatically as the broaches pass. The parts drop on an endless, sectionalized conveyor belt which carries them out of the machine.

In the broaching set-up shown in Fig. 6, ring gear blanks from a previous operation slide down a chute, part of which is seen at the right of the machine. The blanks are picked up and positioned by transfer bars, thus providing fully automatic loading. Clamping of the ring gear blank in the broaching position is also automatic. As the broach clears the part at the end of the stroke, an automatic handling mechanism releases the broach. Then the transfer bar picks up the finished part and carries it to a conveyor



**Fig. 5.** As finished parts drop off ends of pull broaches, they are deflected onto conveyor by baffle that automatically swings into place.

Fig. 6. On this completely automatic machine, ring gear blanks are positioned in and carried out of broaching position by transfer bars.



(not shown) at the left. Thus, no manual handling of the work is required on this completely automatic, transfer type machine.

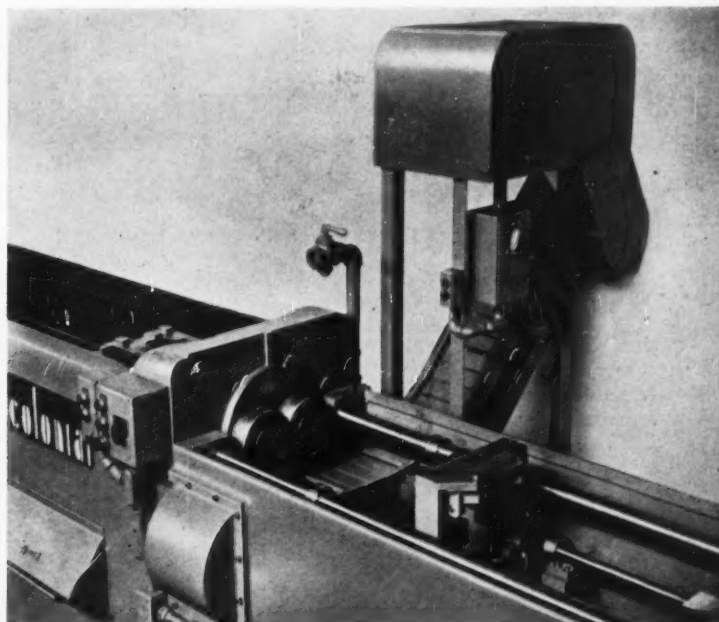
An automatic parts ejection conveyor used on a horizontal broaching machine is seen in Fig. 7. In conjunction with this, the machine is equipped with an automatic broach handling mechanism. In operation, the parts are placed over the pilot ends of the two broaches—the only function required of the operator. The broaches carry the parts with them into broaching position against the faceplates. There the broaches are engaged by pullers and drawn through the work. The finished parts drop on an ejector conveyor, which removes them from the machine, and the broaches return to their start-

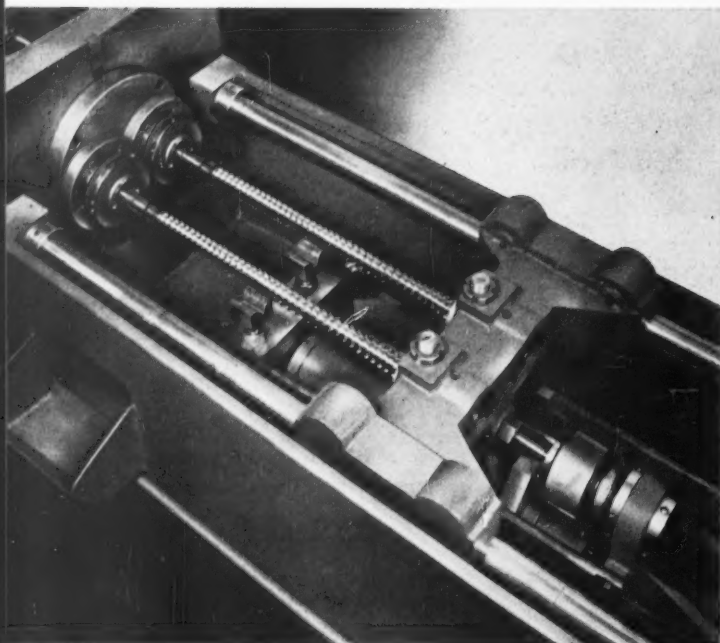
ing position. The raised partitions on the conveyor belt are needed to transport the work to a higher level for ejection.

On horizontal broaching machines requiring the use of several broaches in sequence, handling can be minimized by providing a traveling broach carrier rack. The rack can be attached to the ram of the machine, so that the rack moves with it. After each broaching pass, the broach is removed and placed in the rack. When the ram is returned to the starting position, the next broach is selected from the rack and inserted in the puller.

An automatic hydraulic mechanism for handling broaches is used on the horizontal machine seen in Fig. 8, which broaches internal

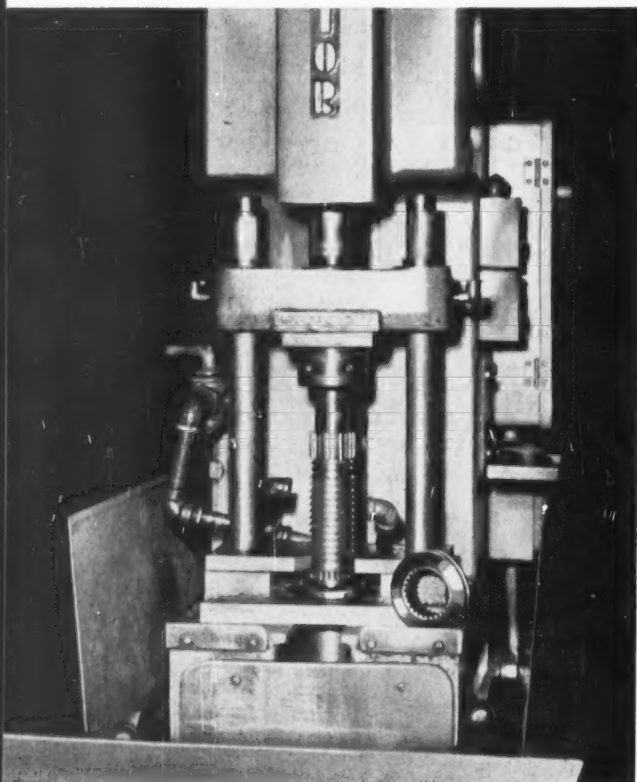
Fig. 7. After the broaches are pulled through the work, finished parts fall on partitioned conveyor belt which raises them to a higher level for ejection.





**Fig. 8.** V-shaped lifters (center) travel along a roller track and support the broaches to prevent sagging, and are lowered as broaches engage pullers.

**Fig. 9.** Set-up for strip broaching of internal splines in synchronizer clutch parts. The piston-rod of an air cylinder guides the broach and serves as a locator.



splines on two parts simultaneously. In operation, the parts are placed over the pilot ends of the two broaches and are carried into broaching position against the faceplates. Two V-shaped lifters are seen at the center. They travel on a roller track and support the broaches to prevent sagging, dropping down as the broaches engage the pullers. When the broaches have been pulled through, the finished parts fall off the broach ends. The automatic hydraulic handling mechanism engages the broaches and pulls them back into loading position. As the broaches return, the lifters are again raised to support them.

Strip broaching is somewhat in the category of automation, because it is unnecessary to stop the machine at both the top and bottom of the stroke. In conventional broaching of holes, the practice is to stop the machine at the bottom of the stroke, remove the part, return the broach to the top of the stroke, and load another part. In strip broaching, the broach is returned through the hole after broaching, without stopping the machine at the bottom of the stroke.

Broach life in strip broaching is reduced to some extent by virtue of the drag of the teeth on the work during the return stroke. However, the reduced number of pieces per grind of the broach is frequently more than offset by the increased productivity per machine and man-hour. Strip broaching is particularly effective where the broach is provided with burnishing rings which actually set up a slight clearance between the returning broach teeth and the bore of the hole.

Strip broaching is employed to produce internal splines in synchronizer clutch parts on the Colonial machine seen in Fig. 9. The broach is guided by the piston-rod of an air cylinder mounted below the platen. The piston-rod is machined to fit the part so that it also serves as a locator during loading, and one end of the rod is machined to receive the pilot end of the broach. Air in the cylinder is compressed back into the line during the broaching stroke, and the line pressure returns the piston during the high-speed return stroke, thus preventing the broach from drifting sideways and dragging the broach teeth against the finished part.

The Colonial multiple-ram press illustrated in Fig. 10 is part of the automotive cylinder head production line at the Willys Motors factory in Toledo, Ohio. Although the operation performed on this machine is actually one of pressing rather than broaching, the methods of automation used would be similar to a broaching operation. The machine inserts valve guides in the cylinder heads. A fifteen-station Footburt transfer machine (not shown) automatically loads the cylinder heads on the press.

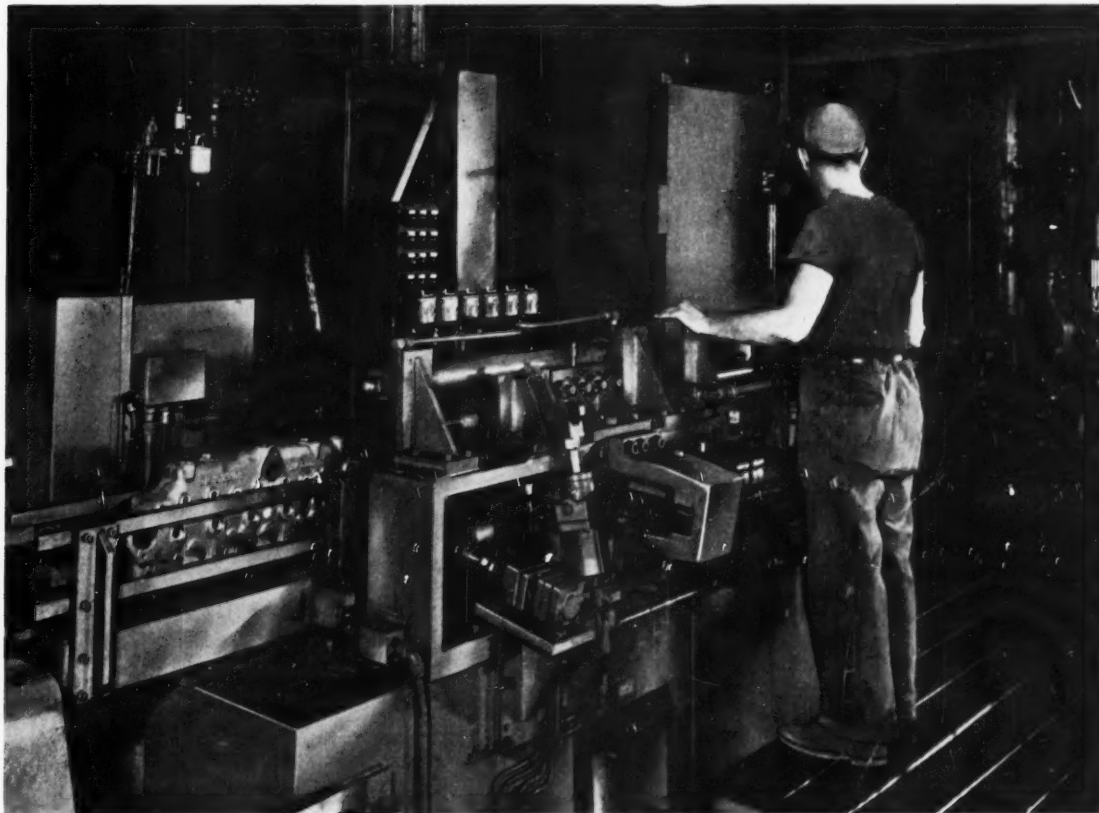
Positioning of the cylinder heads in the press is done automatically. The cylinder heads are picked up at the loading station by a transfer bar and pulled into the work station. Diamond-tipped locating pins then enter previously drilled and reamed holes at each end of the casting, thus positioning the work for brushing and stamping. The cylinder head is again pulled by the transfer bar to the next station where the part is once more positioned by locating pins. Here the six valve guide pins are inserted in the cylinder head.

A simple automation device, which can be important in broaching because of the high rate of chip production, is a conveyor for continuously removing chips from the base of the machine.

\* \* \*

One of this country's best jet engines, which has been in production during the last three years, requires 109 different materials in its manufacture, of which 70 are specified types of steel. A more recent and powerful model requires 133 materials in its construction.

Fig. 10. Multiple-ram press for inserting valve guides in automotive cylinder heads is equipped with transfer bar for automatic positioning of heads.





# Materials

## OF INDUSTRY

The properties and new applications of materials used in the mechanical industries

### **A Chromium-Manganese Steel that Substitutes for 18-8**

A chromium-manganese stainless steel that is an austenitic alternate for 18-8 stainless steel has been developed by the Allegheny Ludlum Steel Corporation, Oliver Bldg., Pittsburgh, Pa. This steel exhibits good cold-working properties, weldability, and ductility. Its composition is as follows: chromium, 14.5 per cent, minimum; manganese, 15.0 per cent, minimum; carbon, 0.15 per cent, maximum; nickel, 0.99 per cent, maximum; nitrogen, 0.25 per cent, maximum; and the balance iron. This steel, hot-rolled to 0.09 inch; annealed; cold-rolled to 0.078 inch; annealed; and cold-rolled to 0.062 inch, exhibited the following properties: yield strength (0.2 per cent offset), 113,150 pounds per square inch; tensile strength, 142,600 pounds per square inch; elongation in 2 inches, 21 per cent; and a hardness on the Rockwell C scale of 29 to 31.

The steel was developed to conserve nickel—in fact, the nickel content had to be kept below 1 per cent because of governmental restrictions. It is to be used where straight chromium steels are unsatisfactory substitutes for 18-8 stainless steel. In applications where requirements include the mechanical properties of welds, ductility, non-magnetic qualities, and cold-working to high strength, this steel could be considered.

### **One-Step Heavy-Duty Cleaner for Iron and Steel**

Oakite Composition No. 26, a detergent for removing extra-heavy soils from iron and steel in one operation, has been announced by Oakite Products, Inc., 126 Rector St., New York 6, N. Y. This detergent combines the heavy-duty cleaning action of both alkaline and solvent type cleaners and also contains surface-active agents, a combination which is effective in removing soils encountered in metal processing. It is said to possess the ability to wet and penetrate heavy soils quickly, loosening them so that subsequent rinsing leaves work surfaces clean. No insoluble

or oily films are left on surfaces after rinsing to interfere with painting or plating. Typical applications of this material include removal of pigmented drawing compounds and of solid-particle dirt and smuts; cleaning before vitreous enameling; and cleaning buffed metal before electroplating.

### **Aluminum Oxide Compositions for Coloring Die-Castings**

A series of aluminum oxide compositions for the coloring of zinc-base and aluminum die-castings has been made available by the Hanson-Van Winkle-Munning Co., Matawan, N. J. These aluminum oxide compositions give castings the desired luster or color quickly. The compositions may also be used in coloring steel and stainless steel.

### **Flux for Soldering Stainless Steel and Other Alloys**

Stainless Steel "48" soldering flux has been developed especially for use on stainless steel; Monel; Inconel; Nichrome; and chromium, manganese, molybdenum, tungsten, and vanadium alloys has been announced by the Remont Mfg. Co., Lombard, Ill. This flux removes oxides without affecting the corrosion-resistant properties of the metal and facilitates tinning and positive bonding. It promotes high capillary action of the solder, is displaced from solid metal by the molten solder, and its residue can easily be removed with water. The flux can be used with the solder-iron, flame, or dip methods of soldering.

### **"Chromizing" Process for Treating Steel or Iron Parts**

A chromizing technique, called "Chromalloying," that makes iron and steel heat-, corrosion-, and wear-resistant is now in commercial operation, according to an announcement made by the

Chromalloy Corporation of New York, 109 W. 64th St., New York 23, N. Y. The process transforms the ferrous metal surface into a high-chromium stainless metal or into a chromium carbide embedded in a high chromium-alloy matrix. Parts to be treated are placed in a sealed retort in contact with a chromium-rich activated dry, powdered compound; heated; and then slowly cooled. The treated surface has a silver-gray, satin-smooth finish (depending, of course, upon the quality of finish prior to treatment) which can be polished, lapped, or burnished into a high luster finish at a slight sacrifice in corrosion resistance.

This technique can be applied to all kinds of cast, wrought, and machined irons and steels with the exception of high-speed steel and free-machining screw stock. A few of the uses to which treated parts have been put are die and tool components for forming tools in the automotive field, zipper dies, and spring fastener punching dies; wear-resistant structural parts for wire-drawing machines and cam movements; nuts and bolts that are subjected to heat; and powder metallurgy parts (iron sinterings) such as pole pieces and structural parts which are difficult or impossible to plate.

#### **Stainless Steel with High Hardness and Non-Galling Characteristics**

The availability of a stainless-steel alloy V2B, both in a cast and wrought form, has been announced by the Cooper Alloy Foundry Co., Hillside, N. J. Combining high hardness, non-galling characteristics, and good corrosion resistance, this material is readily machinable in the quench-annealed state and may be hardened by a low-temperature heat-treatment that produces no distortion. In the annealed condition, the material is easily welded, using special welding rods. In addition to its use in a variety of corrosive applications, it may be safely used in steam applications and at temperatures up to 1400 degrees F., since it does not over-age at high temperatures.

Its composition, in per cent, is as follows:

|            |                |
|------------|----------------|
| Carbon     | less than 0.07 |
| Chromium   | 19.0 to 19.5   |
| Nickel     | 9.75 to 10.25  |
| Silicon    | 2.75 to 3.25   |
| Copper     | 2.0 to 2.25    |
| Molybdenum | 3.0 to 3.50    |
| Manganese  | 0.50 to 0.75   |
| Beryllium  | 0.10 to 0.20   |
| Iron       | Balance        |

The Brinell hardness numbers of this alloy are 302 as cast; 269 in the quench-annealed state; and 363 in the annealed and hardened state. Other properties include a tensile strength of

151,000 pounds per square inch, a yield strength of 122,400 pounds per square inch, and an elongation in 2 inches of 3 per cent.

Applications include the making of such items as valve discs, plug cocks, shaft sleeves, impellers, pump casings, wearing rings, poppets, conveyor links, rollers, gear blanks, and other parts requiring both wear and corrosion resistance.

#### **Hard Vinyl Material that is Used for Machine Nameplates**

Nameplates, instrument panels, and imprinted dials are now being made from Lucoflex, a non-plasticized polyvinyl chloride plastic that resists the action of most solvents, brine, and other corrosives. It has been introduced by American Lucoflex, Inc., 500 Fifth Ave., New York City. This plastic exhibits a metal-like machinability and can be fabricated by all the usual processes. It can be milled, bored, and welded. Screws are also made from the rod form of this plastic so that the entire nameplate assembly is corrosion-resistant. Furthermore, it is unaffected by aging at elevated temperatures, and can be etched with vinyl inks that provide a permanent coloring.

#### **Corrosion-Resistant Coating for Ferrous Metals**

An addition to the "Vinsynite" group of corrosion-resistant metal coatings has been announced by Thompson & Co., 1085 Allegheny Ave., Oakmont, Pa. It is designated Vinsynite FS-3, and is a treatment formulated especially for roller coating on ferrous metals. It is yellow in color. When baked as recommended, the coating provides good adhesion on ferrous metals and resistance to all types of exposure. This product is intended for use under top coats but will itself protect surfaces for short periods of time. In effect, it chemically pretreats the metal and covers it with a thin film in one operation.

#### **Compound for Cleaning and Pickling of Metals**

A product containing soluble fluorides and penetrating and dispersing agents, which when used in combination with sulphuric acid can remove silica, sand, and scale from steel, has been announced by Enthone, Inc., Dept. M, 442 Elm St., New Haven, Conn. When used with nitric acid and ferric sulphate, this product can pickle stainless steel. "Actane 33," as it is called, can also be used with sulphuric acid for etching aluminum and with nitric acid to produce mixtures that remove silicon and copper from aluminum to produce white clean surfaces.

# How Size Tolerances Affect Gaging Requirements

Tolerances are established to control variations in the size, form, position, and functioning of the features of a product. In this fourth of a series of articles on dimensions and tolerances for mass production, the author shows how tolerances on conditions of size are selected and how they determine the gaging requirements

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IT is an axiom in the shop that the accuracy to which one can work depends upon the accuracy to which one can measure. Hence the verification of all dimensional specifications depends upon their measurement. In other words, the amount as well as the nature of any error must be known before direct and effective steps can be taken to correct it. This is another way of saying that the dimensions and tolerances on detail drawings specify the requirements of their measurements, or the requirements of the inspection gages. Furthermore, it is futile to write specifications that will not be actually verified.

## Dimensions and Tolerances on Conditions of Size

The problem of expressing tolerances on *conditions of size* of elementary surfaces is the simplest one to solve, and, on the whole, present practices are adequate for this purpose. Even so, consideration must be given to all of the many conditions that may be acceptable to the inspection gages whose design is directly implied by the dimensional specifications on the detail drawing. Probably the best and clearest

way to present this subject is by means of specific examples. In doing this, a single component, or a feature of it, can seldom be considered by itself since it has some function to perform, or some service to render, in the assembled product, and this is nearly always in combination with some other component or feature of another component. All dimensions and tolerances on the component must be chosen to meet the functional needs of the product.

**Relation Between Basic Dimension and Design Sizes**—The first example, Fig. 1, is that of a cylindrical shaft feature and its mating cylindrical bore or bearing. The *basic size* of these features is 2.250 inches. The allowance is determined either by direct experiment or from past experience on a similar feature performing substantially the same duty, or from an available standard limit system. The allowance selected for this example is 0.002 inch and the basic hole system is used. Hence the design size of the bearing is the basic size of 2.250 inches and the design size of the shaft is 2.248 inches.

One argument in favor of the use of the basic hole system is that the tools and gages for the hole member are often of fixed size, that is, they

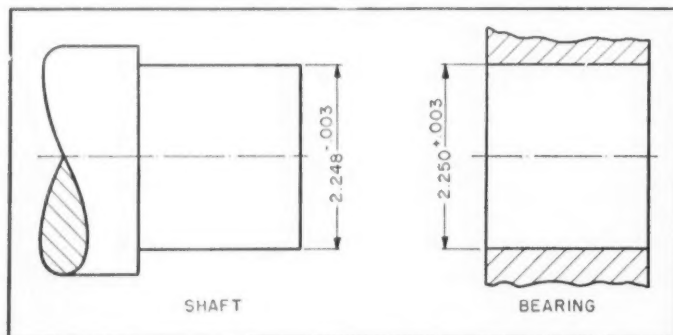


Fig. 1. The basic size of this mating shaft and bearing is 2.250 inches. Since the basic hole system is used, the design size of the bearing is also 2.250 inches. For the shaft, an allowance of 0.002 inch from basic makes the design size 2.248 inches.

are not adjustable. If the design sizes of the holes are the same as the basic sizes and if these basic sizes are restricted to a limited series of standard sizes, then reamers and gages for these holes can be obtained more quickly and more cheaply than if tools of special sizes were required. The shaft member is generally machined by processes that can readily be adjusted to size, and many of the gages for such members are also adjustable. Under such conditions, the use of the hole basis is a measure of economy in manufacturing.

**Selecting and Interpreting Tolerances**—The tolerances are selected either on the basis of past experience with a similar construction performing a similar duty or from the values given in an available limit system. The extent of these tolerances control, in a large measure, the type of manufacturing process needed to finish the particular feature. Too small a tolerance adds needless expense in manufacture; too large a tolerance results in improper functioning. In many cases, the tolerance originally selected will be changed later as experience in production shows that a wider tolerance will facilitate production and not affect adversely its performance in service. In this example, the tolerance on each member is 0.003 inch. Unilateral tolerances are used here. This gives the following values—

|                      |       |        |    |       |
|----------------------|-------|--------|----|-------|
| Diameter of bearing: | 2.250 | + .003 | or | 2.250 |
|                      |       |        |    | 2.253 |
| Diameter of shaft:   | 2.248 | — .003 | or | 2.248 |
|                      |       |        |    | 2.245 |

There is no need to include the notation of minus zero for the bearing or of plus zero for the shaft. Where limiting values are given, the top value should always be the design size, which is *usually* the maximum metal limit size, as it is in this case.

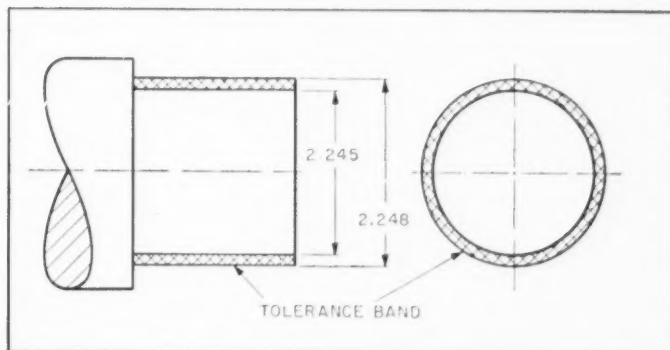
The introduction of a tolerance on a dimension makes that size a variable quantity rather than

a constant one. Thus a range of operating and assembly conditions must be considered rather than a single one. The next question is: What is the nature of the permissible variations? The range of these for the shaft is shown graphically, to a very distorted scale, in Fig. 2. The maximum metal limit for size of the shaft is 2.248 inches; its minimum metal limit of size is 2.245 inches. The difference between these two diameters establishes a tolerance band, as indicated by the cross-hatched areas shown in Fig. 2. With these size specifications alone, without any other restrictions, a product whose size or form lies wholly within the prescribed tolerance band meets these specifications. If the smoothness of the cylindrical surface is an important functional factor, some specification of surface finish must be added. This may be in the form of some surface finish symbol, special note on the drawing, or general specifications on surface finish. Surface finish is another problem related to the physical specifications of a component or of its features which will be considered later.

The tolerance band established by the diameter specifications alone permits a small amount of taper and small departures from the true cylindrical form, as well as variations in diameter, as long as no one, or no combination of these errors, falls outside of the prescribed tolerance band. If the errors in the cylindrical form must be limited to anything less than this tolerance band permits, then a further limiting specification of form must be added. This, again, is another problem relating to the physical geometric specifications which will be covered later. The operational requirements in each case determine whether or not such additional restrictions are needed.

**Gages are Based on Dimensional Specifications**—These dimensional specifications represent the inspection gage requirements, and this must be the accepted interpretation of the language of the drawings, if endless arguments about many trivial matters are to be avoided. Strictly speaking,

Fig. 2. The tolerance bands for the shaft and bearing shown in Fig. 1 control the permissible size variations only. They do not control surface finish, out-of-roundness, taper, and variations in diameter that fall within the bands.





the prescribed dimensional requirements of this shaft feature will be met if the product is acceptable to a 2.248-inch GO ring gage and a 2.245-inch NOT GO snap gage.

The actual size of the ring gage is modified by the wear allowance and gage tolerance. Wear in service increases the size of this GO gage. Hence both wear allowance and gage tolerance must make it smaller. It must never be larger than the maximum metal limit size specified by the detail drawing. The structural sizes of the GO ring gage—outside diameter and thickness—should generally be in accordance with an adopted standard for gage blank sizes. All acceptable products must enter this gage without forcing. Sometimes the practice is followed that the work must enter the gage with no greater force than either the weight of the product or the weight of the gage (whichever is lighter).

The size of the NOT GO snap gage is modified by the gage tolerance. It must never be smaller than the minimum metal limit size specified by the detail drawing. Any gage tolerance must make the actual size larger. As noted before, there is no need of a wear allowance (except for the purpose of discarding worn gages) on the NOT GO gage. All wear brings its size further

inside the minimum metal limit size of the product. The general design of this snap gage should be in accordance with an adopted standard for gage blanks. This gage may be of fixed size or it may be of an adjustable snap gage form. None of the product is acceptable if this gage passes over it without forcing. A common practice is that the force used must be no greater than the weight of the gage itself.

The use of a GO ring gage insures that the maximum metal size of the product will never be outside of the circle or ring that represents the maximum metal limit of size specified on the detail drawing. In some cases this is of the utmost importance—for example, in the case of a projectile which must always pass through the cylindrical bore of the gun without any interference. The use of a NOT GO snap gage can insure that no diametral measurement of the product is less than the prescribed minimum metal limit of size as given on the detail drawing.

Sometimes, however, the functional conditions of the product are not so severe or the process employed to machine the cylindrical feature may be known and be of proved reliability as regards the trueness of the cylindrical form produced. In such cases, a progressive snap gage of fixed size, or of an adjustable type may be used. The sizes for these gages are the same as before. Such progressive gages reduce considerably the amount of time needed for inspection as compared with the time needed to use a GO ring gage and a NOT GO snap gage.

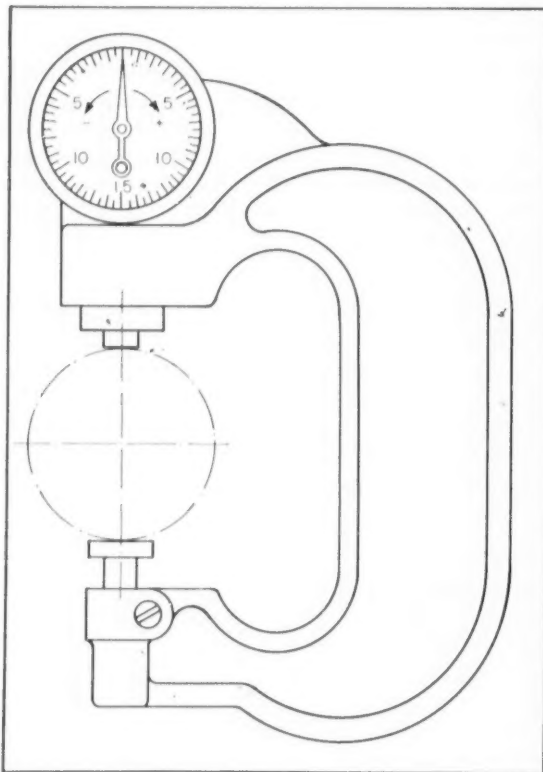


Fig. 3. A simple comparator graduated to read to 0.0001 inch is more effective than limit gages of fixed size when the shaft tolerances are very small.

**Fixed-Size Limit Gages Versus Indicating Comparators**—When the operating conditions of the product are very critical and consequently the tolerances are very small, any appreciable gage tolerance uses up too great a percentage of the product tolerances so that limit gages of fixed size are of questionable value. Furthermore, under these conditions a relatively small variation in the gaging or measuring pressure can make an appreciable difference in the measurement, particularly on such parts as may be close to a borderline condition. With very small tolerances, practically all of the parts are close to such a borderline condition. In such cases some form of a comparator is necessary. Mechanical, optical, electrical, and other types of indicators are available that can measure—under a practically constant measuring pressure and with adequate temperature control—differences in size of extremely small amounts, even to millionths of an inch.

Temperature precautions must be taken when the measurements of very small amounts or differences are involved—say, for example, differences of less than 0.0002 inch. In such cases,

Fig. 4. The difference between the maximum metal limit and the minimum metal limit establishes the tolerance band for the bearing, as shown by the cross-hatched area. The extent of this band permits a small amount of taper and out-of-roundness, as well as the diameter variation.

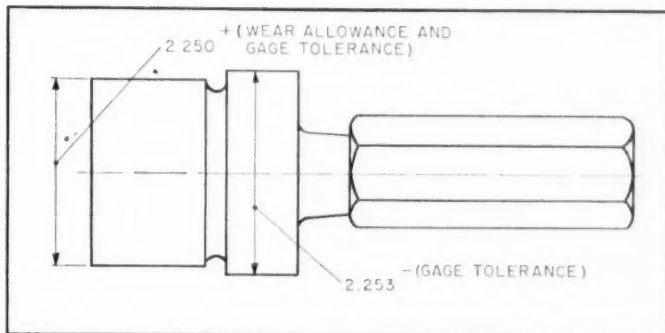
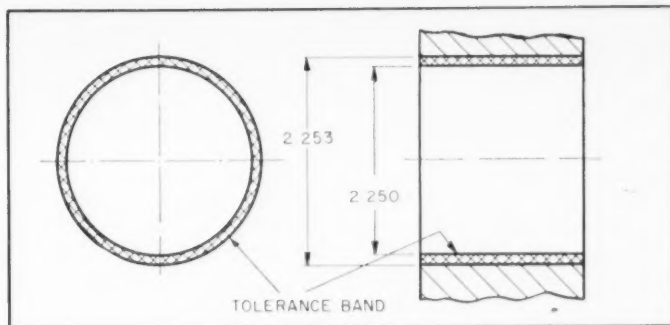


Fig. 5. The use of a progressive type limit gage results in more rapid inspection of through holes than the use of separate GO and NOT GO plug gages.

attention must be given to the temperature of the work and that of the gage. The temperature of both must be the same within very small limits. In extreme cases, such measurements must be made in a controlled temperature room, and further precautions must be taken so that the heat of the body of the operator is insulated from the work and from the comparator. Extreme cleanliness of the work being measured is of the utmost importance. The assumption that a tolerance of 0.0001 inch can be maintained without adequate temperature precautions is but a fond hope and not a reality.

The indicators of these comparators are adjusted to an accurate check gage or to master size blocks, generally of the maximum metal size to be measured. The reading of the indicator is generally accepted as a true measure of the departure from size of the test gage. In extreme cases, each indicator must be carefully calibrated and either the calibration correction applied or else a second test gage of the minimum metal size is used to determine the reading of the indicator for that value.

A simple comparator using a mechanical dial indicator gage, graduated to read 0.0001 inch for each division on the dial, is shown in Fig. 3, as a third alternative method or type of inspection equipment for the shaft. Such a device would be used when the tolerances are too small to be controlled effectively by limit gages of fixed size. With such equipment the shaft is rolled along the anvil under the measuring element of the

dial indicator. When the maximum reading of the dial indicator is within the specified range, the work is acceptable for size; when this reading is above or below the specified range, the work is over size or under size, respectively, and is rejected.

In some factories, a large part of the inspection equipment uses such dial indicators so mounted that they have a wide field of application. An ingenious designer can utilize them in an almost infinite number of ways.

**Use of Automatic Gaging Equipment**—In addition to this manually operated inspection equipment, special gaging or inspection machines are designed and built which automatically measure and sort the product according to size or sometimes according to certain factors of functioning. These machines, which are used when the volume of production is extremely large, may be fed by hand or from a magazine. When size is the criterion, a size-indicating device that makes electrical contact at either limit is employed. When electrical contact is made at either the maximum or the minimum metal limit of size, an electrical relay comes into action which ejects the faulty product at a subsequent position of the work-carrier. The conditions which these gaging machines must detect are identical with those which the manually operated gages must identify.

The exact design of the frame of the gage is of secondary importance. The essential thing is

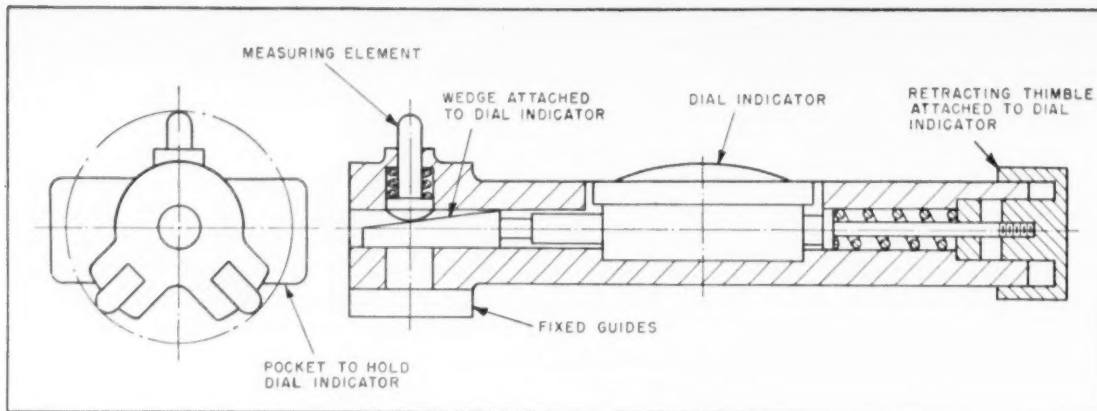


Fig. 6. Where the gage tolerances would use up too great a part of the product tolerance, a dial indicator gage of the type shown may be more effective for checking internal dimensions.

that the gaging surfaces of different designs of gages for the same product must measure the same characteristics of the product, must select to the same limiting sizes, must be sufficiently rigid to maintain the sizes under actual conditions of use and abuse, and must not mar or in any way injure the surfaces of the product. In other words, as long as the gages give an adequate inspection of the product, all other considerations of design are secondary. Effectiveness and economy of inspection are the primary requisites.

#### Tolerance Band and Gages for the Bearing—

The nature of the permissible variations for the bearing member is similar to those for the shaft member. The nature of these variations is shown graphically, as for the shaft, in Fig. 4. The maximum metal limit of size for the bearing is 2.250 inches in diameter and the minimum metal limit of size is 2.253 inches in diameter. The difference between these two diameters establishes a tolerance band as indicated by the cross-hatched area which is shown in Fig. 4. With these size specifications alone, any product whose size or form lies wholly within the prescribed tolerance band meets these specifications. The extent of this band permits a small amount of taper and a slight amount of out-of-roundness as well as the diameter variation.

It should be noted, however, that a hole to the maximum metal limit of size in diameter must be perfect in form without any taper. Errors in form reduce the amount of the tolerance that remains for the diameter variation. As stated before, if the smoothness of surface and the trueness of the cylindrical surface are important functional factors, some further specification limiting these conditions must be added to the detail drawings.

These dimensional specifications give the limiting sizes of the inspection gages. These gages can be in the form of a 2.250-inch GO plug gage and a 2.253-inch NOT GO plug gage. The prescribed dimensional requirements are met if the GO plug gage passes through the bore of the bearing without forcing and the NOT GO plug gage does not. As before, the weight of the gage itself is often used as the maximum limit of force that should be applied; that is, the GO gage must pass through the bore of the bearing of its own weight while the NOT GO plug gage must not pass through of its own weight.

The size of the GO plug gage is modified by a wear allowance and a gage tolerance. Its diameter can be larger than the maximum metal limit size of the bore but not smaller. The size of the NOT GO plug gage is modified by a gage tolerance alone. Its diameter can be smaller than the minimum metal limit size of the bore but not larger. The general sizes of the gages and their handles should be in accordance with an adopted standard for gage blanks. It is common practice to make the length of the NOT GO gaging cylinder much shorter than that of the corresponding GO gaging cylinder for two reasons: (1) for ready identification; and (2) because the NOT GO gage receives less wear in service than the GO gage and so does not need as great a gage surface to resist it as does the GO gage.

When the diameters involved are not so large that the weight of the gage becomes excessive, a progressive limit plug gage, as seen in Fig. 5, is often employed. This requires, of course, that the design of the component is such that the GO gage can pass through the hole or bore without bottoming. It cannot be used on a blind hole or on one with a shoulder at the end of the bore. As with the progressive snap gage, the use of a gage of this design results in more rapid inspection

than the use of a pair of independent gages. On the other hand, when the GO feature of the gage is worn to its prescribed rejection limit, the whole gage, including the still serviceable NOT GO feature, must be discarded. Even if some salvage practice, such as chromium-plating, is followed, both features must be refinished to size in order to restore the gage to service. Even so, the reduction in the cost of the inspection will often more than absorb the additional expense of salvaging the NOT GO feature, and may even more than pay for a new progressive gage.

Here also, with holes or any other form of feature, when the tolerances are very small and any practicable gage tolerance uses up too great a part of the product tolerances, limit gages of fixed size cannot be economically used. For the larger diameters of holes there are adjustable end measures which can be used as limit gages for the diameters. But even these cannot be used effectively for very small tolerances. For these small tolerances, and also for many larger ones, there are a number of different designs of indicator gages and other comparators for holes with diameters down to 1/2 inch or so. For the larger diameters, there are various designs of three-point gages (sometimes called "star gages") which can be used. Some of them indicate the size, or difference in size, by means of a vernier scale, others have a micrometer screw and barrel, while still others make use of a dial indicator gage. Effective air gages are also available for this purpose.

An example of a dial indicator gage for the inspection of the bearing in question is shown in Fig. 6. A check ring or master ring gage is used to establish the zero point on the dial. The taper wedge that acts on the measuring element is retracted when the gage is first entered into the bore, and is released when the gage is in its measuring position. If the wedge is made to give an axial movement of ten times the difference in the diameter reading, then a dial indicator gage whose divisions indicate a distance of 0.001 inch will have a reading of one division for a variation of 0.0001 inch in diameter for the bore.

**Thicknesses, Widths, Lengths**—Other elementary surfaces, such as the thickness of a plate, width of a tongue or groove, length of a part or a feature of a part, are treated in a similar manner to the examples previously given. For operating and mating parts, both allowances and tolerances must be selected. For non-operating but mating parts when conditions of variations in position must be met, a suitable allowance must also be selected to meet the variable position conditions.

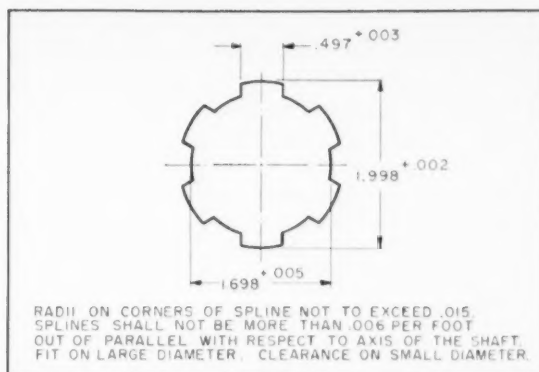


Fig. 7. The permissible variations of this splined fitting are governed by the tolerances specified and a note regarding the alignment of the splines with the axis of the mating splined shaft.

In all cases, the effect of the tolerances is to establish tolerance bands or metal tolerances at the specific surface. With tolerances of size alone, the surfaces can have small variations in flatness and parallelism as long as they remain within the tolerance band established by the tolerances. If flatness, parallelism, and smoothness of surfaces are essential functional conditions, then additional specifications must be given to limit these conditions to the extent required.

The translation of the limiting sizes into inspection gages is similar to that for shafts and bearings. Snap gages are used for lengths, thicknesses, and widths of tongues and keys. Plug gages are used for widths of grooves and keyways, etc. A cylindrical plug gage may be used at times but a rectangular plug gage is generally better. The cylindrical plug gage is cheaper and easier to make than a rectangular one, but the measuring contact area of a cylindrical gage in a groove is line contact, hence the rate of wear is greater than that of a rectangular gage. The problems of wear allowances and gage tolerances are the same as before.

When the extent of the tolerances is very small, some form of indicator gage or comparator must be used. Limit gages of fixed size do not give effective inspection of surfaces with very small tolerances.

**Composite Surfaces and Cumulative Tolerances**—Sometimes a composite surface must be dimensioned with tolerances where effective means of rapid measurement in inspection are not available for the size, form, and position of all the individual elements of the surface. A practice commonly followed in such cases is to give the tolerances for conditions of size alone on the several elements. This practice establishes a tolerance band, based on perfect forms and positions



of elements, for every element of the composite surface. Then these tolerances are considered as cumulative and all errors of form and position must also lie within the tolerance band so established. In many respects, this practice conforms to that for elementary surfaces. It is then possible to make gages for rapid inspection that check the extreme conditions of size so established, but the errors of form and position of elements of the composite surfaces so measured will remain indeterminate.

The GO gage that checks the maximum metal limit conditions can include all or as many of the elements of the composite surface as may be desired, but individual NOT GO gages must be provided for each element of the composite surface to maintain effective inspection. In many cases, such a treatment is adequate.

In some cases, however, where the conditions of form and position of certain elements of the composite surfaces are of greatest importance to the correct functioning of the part in service, this method requires the restriction of the tolerances on conditions of size to much smaller amounts than would otherwise be necessary. This leads to the use of more expensive manufacturing processes than would otherwise be needed. Such conditions persist, however, because of the lack of rapid and economical means of inspection of the critical element or elements. This emphasizes the fact that the accuracy to which one can work depends upon the accuracy with which one can measure. Adequate means of measurement must be developed to correct such conditions.

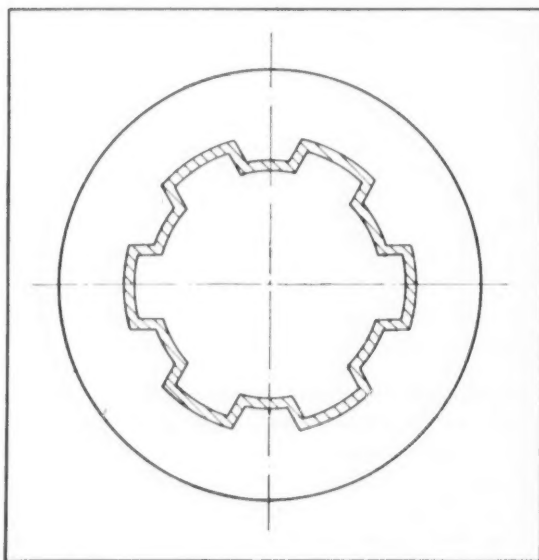


Fig. 8. The tolerance band established by the tolerances on conditions of size for the splined fitting in Fig. 7 are shown, to an exaggerated scale, by the cross-hatched area.

Here follow some examples of composite surfaces with cumulative tolerances expressed on conditions of size, starting with a splined fitting.

**Splined Fitting**—A standard 2-inch, six-spline fitting is used as the first example of cumulative tolerances on conditions of size of a composite surface. As previously noted, this example involves something more than conditions of size, but the variations permitted are governed entirely by the tolerances given on conditions of size. The dimensional specifications for this splined fitting are given in Fig. 7. The tolerance on the small diameter has been increased over that specified in the standard because this splined fitting is to fit the companion splined shaft on the large diameter, so the small diameter defines a clearance surface. This splined fitting is to permit sliding when not under load.

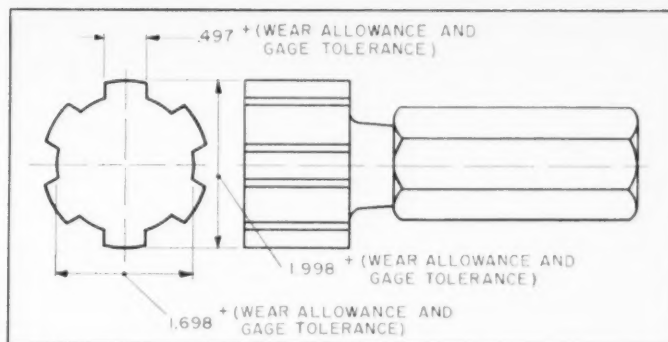
The tolerance band established by the tolerances on the conditions of size is indicated, to a distorted scale, by cross-hatched areas in Fig. 8. In this case, as in all others, the dimensional specifications establish the inspection gage requirements. The GO gage in such cases is actually a functional gage which checks the assembly conditions of the component.

The finished surfaces are produced by broaching and all of them will be finish-machined by the broach at the same time. Here, however, there are several spline teeth, and their positions relative to each other are most important. Any errors in the angular position of any spline tooth will prevent each of the teeth from carrying its full share of the load. For uniformly distributed loads, all of the teeth must be in their correct angular position. There is more than interchangeability involved here.

Methods and symbols for tolerances on conditions of position will be discussed later. Such location tolerances, however, are superimposed upon any tolerances on conditions of size and are based on the maximum metal sizes of the features. These positional tolerances might be marked *MEASURED*, in which case the tolerances on conditions of size would not influence the positional results. But the measurement then called for would be that of the accuracy of the indexing of the several splines and might offer some complications, or at least require more time for inspection than could be afforded.

In Fig. 7 is also given a separate specification for the position of the splines relative to the axis of the fitting. This is another positional specification that does not fit into the general plan for defining the positional tolerances by a simple symbol, and so will be treated here as a special case to complete the translation of all of the drawing specifications into inspection gages.

Fig. 9. This GO gage for the splined fitting in Fig. 7 is made to the maximum metal limit of the large diameter, small diameter, and spline width, plus the wear allowance and gage tolerance.



Referring again to the tolerance band shown in Fig. 8, the inspection gages must insure that the physical sizes of the product lie wholly within this tolerance band. The GO gage, see Fig. 9, is made to the maximum metal limit of the sizes of the large diameter, small diameter, and width of slots or splines. The actual sizes on the gage are modified by the wear allowance and gage tolerance as usual. This gage includes all elements of the composite surface. All fittings which allow this gage to enter without forcing will assemble with the companion splined shaft, and none of the sizes of the product will violate the maximum metal limits of size.

The outside corners of the splines on this GO gage will be chamfered at 45 degrees for a width of 0.015 inch to clear the maximum permissible radius at the corresponding corners in the splined fitting. The corners at the bottoms of these splines on the gage will either be sharp or relieved so as not to interfere with the mating corners on the splined fitting at the small diameter if they should happen not to be rounded to the maximum value. If it is necessary to check these last corners, then a separate fillet profile gage would be provided for this purpose. In the majority of cases, this may not be necessary because a visual inspection will generally be adequate. Another method to control these fillets would be to provide a fillet gage, or a wire of 0.030-inch diameter, to check the forms of the fillets on the broach itself.

As noted before, as many sizes and elements of the composite surface as may be practicable can be combined on the GO gage, but only one size or element can be gaged at a time on a fixed size NOT GO gage which checks the minimum metal limit conditions. Therefore, three NOT GO gages are required here: one for the large diameter, one for the small diameter, and one for the width of spline. These gages are shown in Fig. 10. The sizes of the NOT GO gages are modified by the gage tolerances.

No direct test is made of the accuracy of the indexing (angular spacing) of the spline teeth

other than, perhaps, the inspection of the broach itself. With this method of composite tolerances, if a greater accuracy of indexing is needed, then the tolerance on the width of the splines must be reduced. This gives an indirect control of this feature.

The use of the gages shown in Figs. 9 and 10 will detect any component whose sizes are outside of the specified tolerance band which is shown in Fig. 8. These cover all of the specifications for the six-spline fitting except the note that reads: "Splines shall not be more than .006 inch per foot out of parallel to the axis of the shaft." This is a condition of position and requires a measurement quite similar to a tool-room set-up. Such tests take time, but probably only a small percentage or sample of the product will need to be actually tested to check the conditions of the production set-up. As long as the broaches and the production set-up remain unchanged, the condition of the parts produced will be very similar to each other in this respect.

A sketch of one type of testing equipment that could be used for this alignment measurement is shown in Fig. 11. A bar—something over 6 inches long, to fit a slot or spline groove in the fitting—must be provided. The end that enters the spline fitting is cut away on an angle, and a wedge is pressed into the spline groove to hold this bar tightly in position. Some form of an expanding chuck must be provided to fit on the bearing diameter (large diameter in this example) so as to hold the spline fitting tightly aligned in position. The central part or stem of this expanding chuck will have an extension sufficiently long to permit the alignment of the shaft axis to be established accurately.

This chuck is mounted on a frame provided with a sufficiently large flat surface to act as a surface plate on which a height gage with a dial indicator gage is used. This height gage is used to check the alignment of both the extension on the expanding chuck and the top edge of the bar which is wedged into the spline groove of the fitting. The extension to the expanding chuck

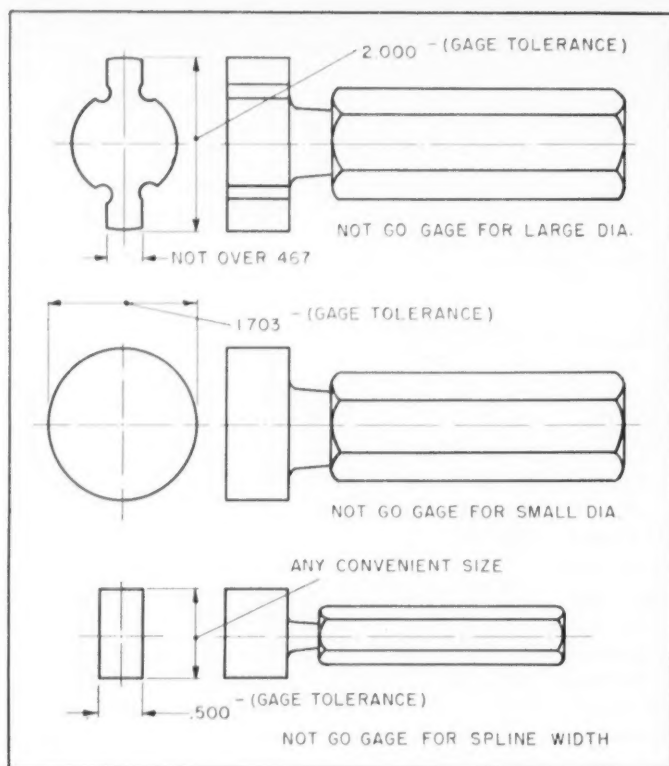


Fig. 10. Three NOT GO gages are required for the splined fitting in Fig. 7. Each of these is made to the minimum metal limit, minus the gage tolerance.

must be parallel to the face of the surface plate of the frame.

In operation, the splined fitting is centered on the expanding chuck and clamped in position. The bar is then wedged in position in one of the spline grooves of the fitting, as shown in Fig. 11. There are two lines engraved on this bar, say, 6 inches from one line to the other. The height gage with the dial indicator gage is then traversed along the bar from one line to the other. If this distance is 6 inches, the maximum displacement of the hand of the indicator must indicate a difference of not more than 0.003 inch to meet the prescribed condition of alignment.

**Size of Fillets**—Another condition of size that often needs to be controlled, to some degree at least, is that of the size or radius of a fillet. Fillets are needed for many purposes. Sometimes they are introduced to reduce the intensity of the stress concentration at some critical point where there is a rapid change in the area of a section. If the surface in question is a clearance surface, then the essential factor will be that this radius is never less than the prescribed value. No tolerance is needed here. The value of the radius is entered on the detail drawing followed by the notation: *MIN*.

In many other cases, sharp corners must be removed for safety in handling. It does not mat-

ter whether these corners are chamfered or rounded. Yet the amount of metal removed must not be excessive. Here a note on the drawing may read, for example: *Break corners not over .015 inch*, or the size of the broken corner may be expressed by the following: *Break corners, .015 inch, MAX*.

At other times, there is a shoulder on a shaft against which a mating part, such as a gear or the inner ring of a ball bearing, is seated. The sharp corners on both the shaft and the mating part must be eliminated. In this case, the radius of the fillet at the shoulder of the shaft is given, followed by the notation: *MAX*. A larger radius (or bevel) for the fillet at the corner of the bore of the mating part must be used to prevent interference at the fillets. Its size is given on the detail drawing followed by the notation: *MIN*.

For inspection of such fillets when the maximum metal limit values are specified, fillet gages are made to the designated values. When held in position against the work, these templates must seat firmly against the shoulder and the bearing surface of the respective component without any tendency to rock on the fillet. If light is visible between the gage and the work, the clearance must be at the fillet surface and not at the shoulder or at the bearing surface. In effect, they are GO gages.

Under some circumstances, the conditions may

exist where a certain minimum size of fillet must be maintained at the shoulder of a shaft because of stress concentration conditions, together with a certain maximum size of fillet which must be specified in order to avoid interference with the mating component. In such cases, the two limiting values for the radius, or a value with a tolerance, must be specified. For inspection, two fillet gages must be provided. The gage for the minimum radius (minimum metal condition in this case) must touch or rock slightly on the fillet surface; the gage for the maximum radius (maximum metal condition in this case) must seat tightly on the bearing surface and against the shoulder and be clear of the fillet. In effect, the maximum metal limit gage must "GO" while the minimum metal limit gage must "NOT GO."

### Summary of Conditions of Size

The result of the application of tolerances to conditions of size is to establish a tolerance band on the surfaces involved. Any physical condition of the product which lies wholly within such tolerance bands meets the specified requirements, despite any variations in form or position that may be present. If the form or position is critical or essential to the functional operation of the product, or to its assembly, then additional specifications must be given to control these factors within the required limits.

The specified conditions of size must be translated into inspection gages that insure that the machined surfaces are kept within the resulting tolerance band.

### Sensitive Corrosion Measurements Made with Interferometer

An interferometer procedure is being used at the National Bureau of Standards for studies of the corrosion resistance of various metals and other materials. The method is believed to have value for comparing and predicting the chemical durability of various materials. With the highly sensitive interferometer method, corrosion to a depth of as little as 0.00001 inch can be detected on optically flat specimens.

Specimens are ground and polished to optical flatness and then immersed to half their depth in the desired corrosive solution. After a specified length of time they are withdrawn, rinsed, and dried, and covered with an optically flat piece of quartz. Using a conventional interferometric viewing apparatus of the Pulfrich type, and an unfiltered helium lamp for illumination, the displacement of the optical interference fringes at the level-of-solution line is observed.

As seen by the observer looking into the eyepiece of the instrument, these interference fringes are vertical parallel lines. If the uniform flatness of the specimen under study has not been impaired by the corrosive solution, these fringes are straight and continuous. However, if the previously immersed part of the specimen surface has been attacked, each of the vertical fringes is shifted laterally at the point where it crosses the change-of-thickness line. If as sometimes happens the solution has caused swelling of the specimen, the lateral shift is in the opposite direction.

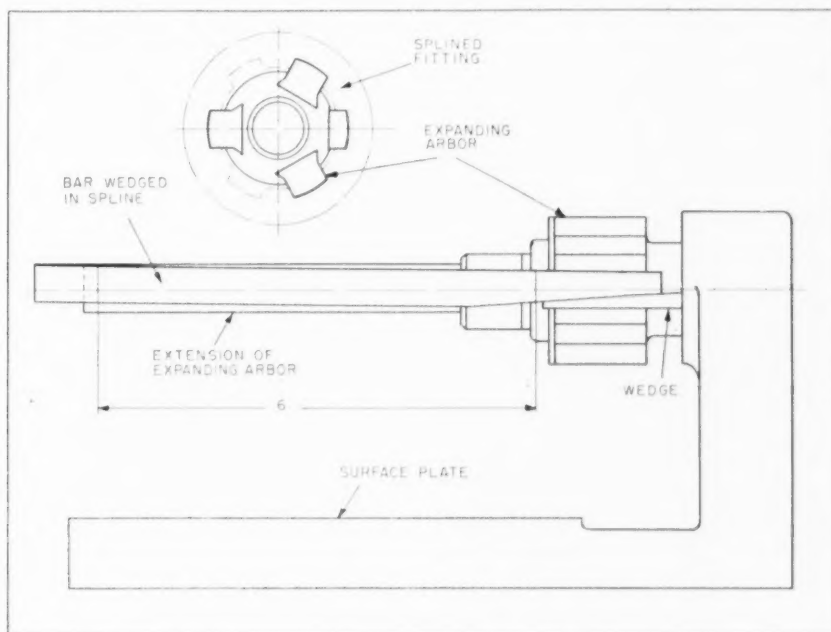


Fig. 11. To check the condition of alignment specified in the note on Fig. 7, testing equipment of the type shown may be used.





## In Shops Around

Camera highlights of some interesting operations performed in various metal-working plants throughout the nation

Making duplicate templates on a converted Delta wood shaper at Northrop Aircraft, Inc., Hawthorne, Calif. A Quackenbush pneumatic router motor drives a carbide-tipped end mill at 18,000 R.P.M. Original template is clamped on top of work and bears against a guide pin. Welded-pipe over-arm structure bolted to table assures accurate alignment of guide pin with motor spindle.

Cutting a 2-inch deep channel in an inner wing spar cap about 12 inches wide at the Douglas Aircraft Co., Inc., Long Beach, Calif. At various points where the web thickness is nearly the same as the thickness of the extrusion, tracer-controlled equipment raises the cutter-head. Hydraulically actuated clamps hold down the spar securely on the table for the milling operation.



# the Country

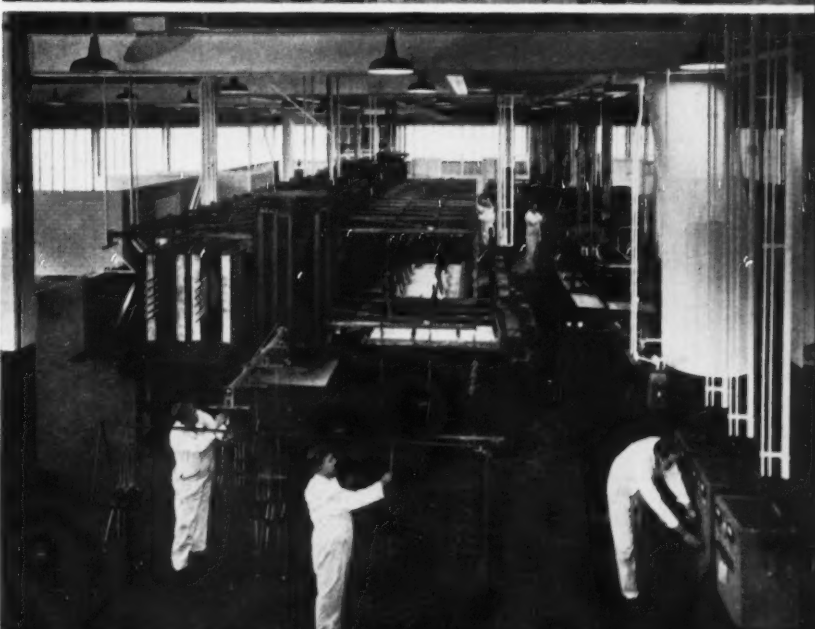
Pressure-testing welded clutch and ring assemblies for automotive transmissions at Chevrolet Saginaw Transmission, Division of the General Motors Corporation, Saginaw, Mich. The Brinell hardness tester used is equipped with a microphone, seen above operator's left hand. A single-tube amplifier is connected to the headphones. Failure to pass the test pressure is indicated by a pinging sound.



Making abrasive wheels at the Precision Grinding Wheel Co., Inc., Philadelphia, Pa., on this new automatically controlled compacting press built by Baldwin-Lima-Hamilton Corporation. The 3000-ton press molds wheels up to 36 inches in diameter, which have the accuracy needed for the precision grinding of balls used in bearings. Both pressing speed and compacting pressure require accurate setting and control in the manufacturing process.



Fully automatic cadmium-plating system makes mass production possible for a variety of electroplating operations at the Swissvale plant of the Union Switch & Signal Division of the Westinghouse Air Brake Co., Pittsburgh, Pa. Items are loaded as here shown, then move through a succession of cleaning, plating, and finishing treatments before emerging from dryer at left.



# Removing Wrinkles in Formed Aluminum Sheets

By GILBERT C. CLOSE

**I**N the short space of five years, hand-finishing time for many formed parts made at North American Aviation, Inc., Los Angeles, Calif., has been reduced 80 per cent. Whereas hand-finishing averaged ten hours for each hour of press production in 1947, today it requires somewhat less than two hours. The parts involved are of aluminum sheet, and are formed on hydraulic presses by the rubber-pad method. The remarkable economy attained has been the result of successfully tackling the problem of wrinkling—a drawback of the rubber-pad method.

Despite the tremendous pressures employed,

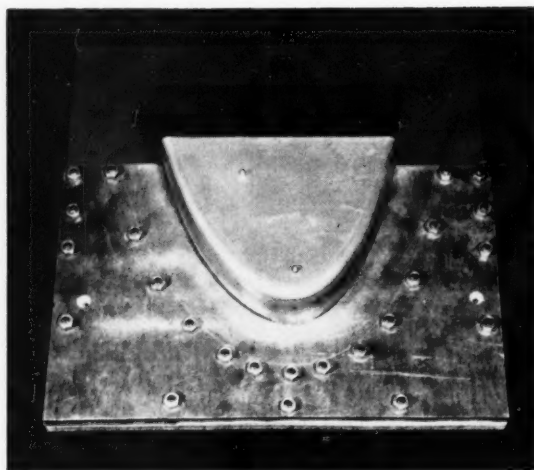


Fig. 2. View of flanged aluminum-sheet part over form-block with clip still in position.

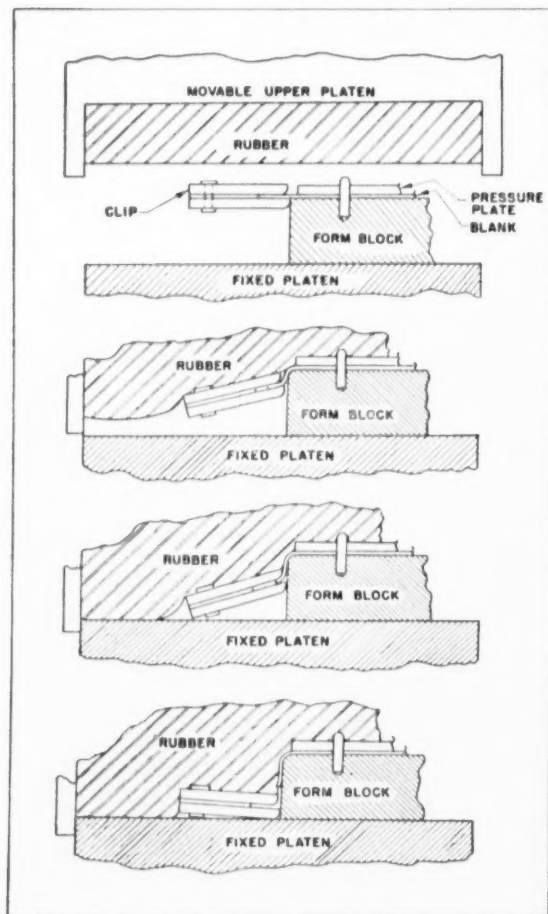


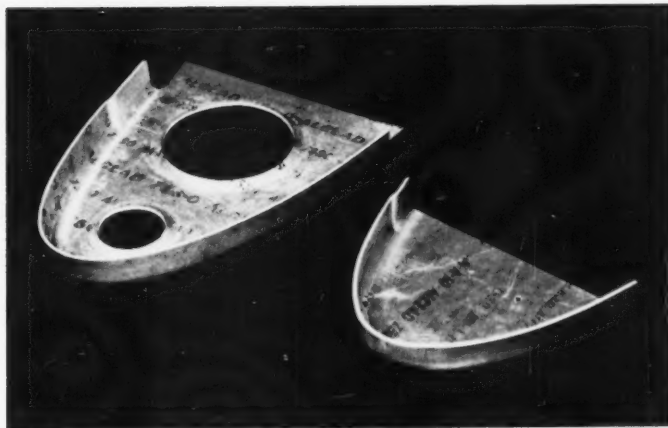
Fig. 1. The clip eliminates many wrinkles from developing during the rubber-pad forming operation.

the rubber pad by itself did not offer sufficient rigidity when a flanged or beaded section was formed from flat sheet. Wrinkles were inevitable, and until recently the press-formed parts had to be fitted to a block and the wrinkles beaten out by hand. This was a slow and tedious process, particularly so when higher air speeds made stronger airframes necessary and sheet of heavier gage was specified for most press-formed parts. Now, a new "clip" developed by two North American Aviation employees reduces the amount and severity of wrinkling during forming, and two small power tools speedily smooth out the few shallow wrinkles that do develop.

The action of the clip is illustrated diagrammatically in Fig. 1. Basically, three sheets of flat stock are bolted together over the part of the work blank projecting from the form-block. Each sheet is sawed along the form-block edge to the contour of the blank. The central sheet is made one gage thickness thinner than the blank so that, when the bolts of the clip are tightened, the edge of the blank will be gripped firmly.

As can be seen from the progressive views in the illustration, during the descent of the upper platen of the press, the rubber pad forces the clip to back off the edge of the blank. The friction grip of the clip restricts the flow of metal while the part is being formed, stretching the excess metal instead of shrinking it and producing wrinkles. Because of its continuous grip on the edge of the blank until the moment of disengagement, an even stretch away from the edge is maintained. As a result, the tendency of the

**Fig. 3.** With heavy-gage sheet, the clip reduces the wrinkles to a point where they are almost imperceptible.



metal to fracture at local points is minimized. Another advantage of the clip is that it does not have to enclose the blank but can be applied only where excessive wrinkling might occur.

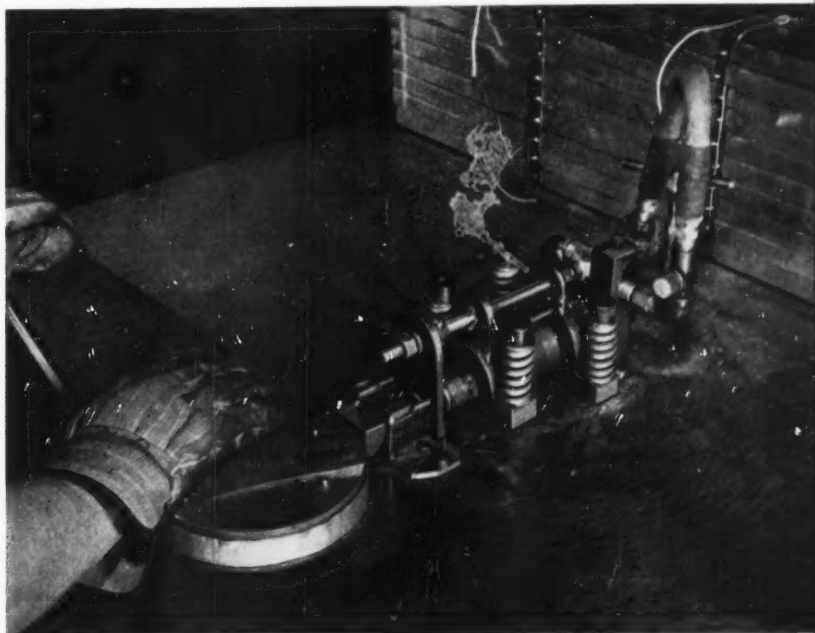
A view of a clip used for a typical rubber-pad forming operation is illustrated in Fig. 2. The clip is shown still surrounding the aluminum sheet that has just been flanged. Two heavy-gage 75S-W aluminum parts that have been rubber-pad formed with the aid of clips appear in Fig. 3. Wrinkling is practically imperceptible.

One of the power tools for smoothing out the few wrinkles that will develop, even when a clip is used, is shown in Fig. 4. This device, used for small work, is a conventional pneumatic rivet gun that has been adapted with a plastic beating block. In use, a built-in switch causes the gun to

operate when pressure is applied to the block. As the rapidly reciprocating gun hammers out the wrinkles, the work is traversed past the block.

For large work, a specially designed automatic tool, Fig. 5, subjects the flange to the action of a motor-driven lead "slapper." Air pressure holds the work down over a mating form while the slapper swings laterally against the flange, delivering up to forty "hits" per minute. The slapper is bent by hand to the general shape of the flange; after a few strokes it assumes the exact contour. A steel strip cast into the slapper imparts strength. The tool was built by the Hufford Machine Works, Inc., Redondo Beach, Calif.

North American Aviation's mastery of the wrinkling problem can be readily visualized by



**Fig. 4.** Wrinkles that develop despite the use of a clip are few and shallow; this modified rivet gun hammers them out of small parts.





Fig. 5. The camera has caught the arc assumed by the lead slapper as it smooths the flange of a formed part.

comparing the flanges of the three identical parts in Fig. 6. The part at the left has been rubber-pad formed without a clip. The part in the center has been rubber-pad formed with a clip, and the one at the right, after being rubber-pad formed with a clip, has been finished with one of the new power tools.

\* \* \*

On the average, an investment of roughly \$10,000 is required to create one additional job in the United States.

### Electrostatic Painting—Theme of New Moving Picture

Production line applications of the No. 2 process of electrostatic painting performed with equipment built by the Ransburg Electro-Coating Corporation, Indianapolis, Ind., are shown in a 16-millimeter color and sound motion picture with a running time of twenty-five minutes, recently made available by this concern. The film gives a brief history of painting methods from brush to spray gun, and then describes the advantages of a new electrostatic atomizer.



Fig. 6. Comparative view of three identical parts: (left) formed without a clip; (center) formed with a clip; and (right) formed with a clip and then finished with a rivet gun.

# Short-Order Shops Save Time in Development Projects

By S. A. YINGLING  
Superintendent, Laboratory Shop  
General Engineering Laboratory  
General Electric Co.  
Schenectady, N. Y.



Fig. 1. Typical parts manufactured on a short-order basis in a shop that serves a General Electric Laboratory

**R**APID machining of parts needed in a hurry is the function of two short-order machine shops for development work in the General Engineering Laboratory of the General Electric Co. Although these shops have been in operation only a relatively short time, they have already proved valuable in expediting engineering development projects. The very nature

of a development project necessitates frequent design modifications as engineering work progresses. These modifications usually involve the making of various new parts. Only the fastest service, without red tape, will avoid holding up the development engineer in trying out his new creation. The average machine shop does not have enough flexibility to meet rush demands.

Fig. 2. A short-order machine shop established for one of the branch plants of the Laboratory

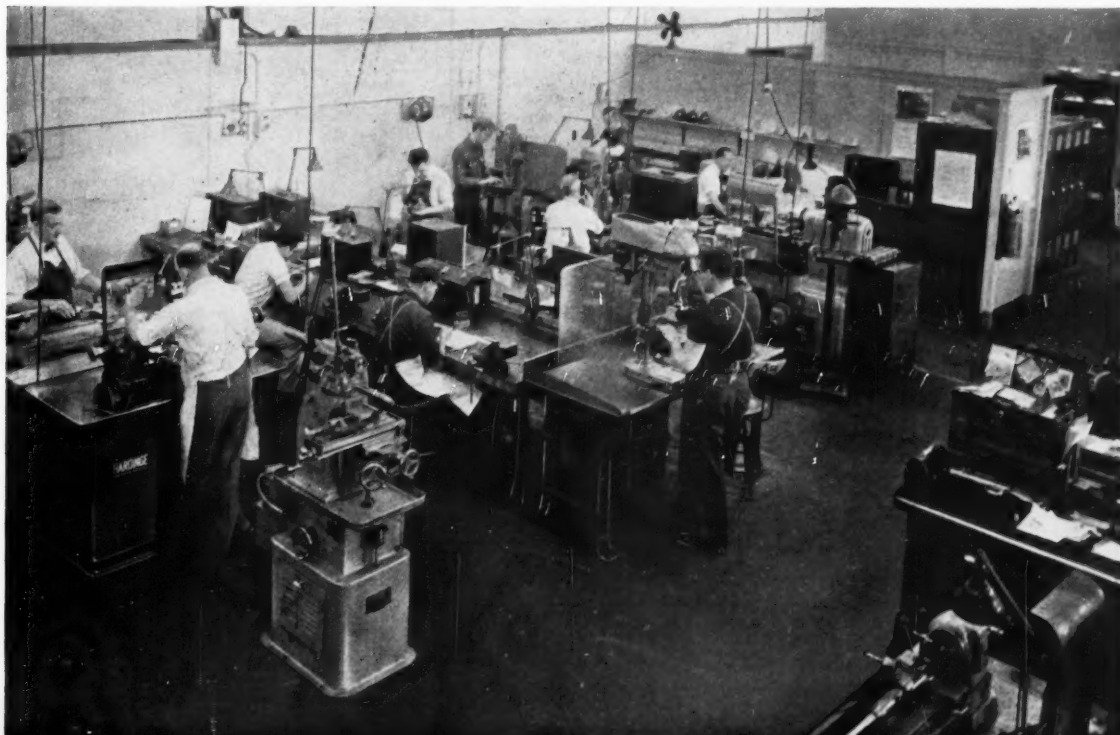




Fig. 3. General view of the short-order machine shop later set up at the main Laboratory

The need for quick and flexible machine shop service is particularly acute in the General Engineering Laboratory, where a major portion of the work is of a developmental nature. Recognizing this need, the Laboratory's shop management began an intensive study of the problem two years ago. The total volume of work that should be handled by the short-order shop was a question of prime importance. Additional questions involved the ideal ratio of mechanics to engineers, the kind and number of machine tools needed, job classifications, and an efficient system of paper work.

As anticipated, the study indicated that the bulk of the work could, with careful planning,

be handled satisfactorily in regular machine shops. The time required for completing an engineering design, and for securing hard-to-get material, is usually sufficient for the regular machine shop to process the work in a normal way. However, the problem of last minute machining remained.

From 10 to 15 per cent of all the machine shop work was found to fall into the short-order category, where delivery was needed within a twenty-four- or forty-eight-hour period. It was further found that virtually all of the short-order jobs required less than eight man-hours of work. After deciding upon the machine tools best suited to handle this type of work, plans

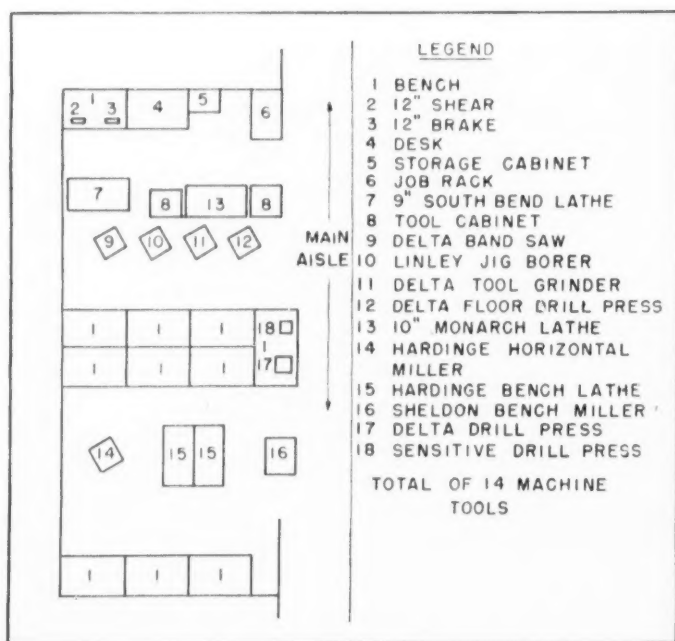


Fig. 4. General lay-out of the short-order machine shop, which indicates the types and arrangement of machines

were made for setting up two short-order shops operated independently of the main machine shops. Authorization to draw manpower and tools from the regular shops in an emergency was included in the plans. In January, 1952, the first of these short-order shops was put in operation at a branch plant of the laboratory. This shop, shown in Fig. 2, is outfitted with fourteen machine tools, including lathes, milling machines, drill presses, tool grinders, jig borers, and band saws. Eight mechanics are continuously employed in this area, with one or two extra men being borrowed from the main machine shop during peak periods.

After the Laboratory's new machine shop was opened at the main plant in October, 1952, a short-order shop was also established there. As a result of the experience gained at the first shop, a larger area was set aside for similar activity, with nine mechanics and twenty-two modern machine tools, in the second shop, Fig. 3.

Each of these short-order shops is under the immediate supervision of a skilled leader and a foreman who extends counsel and guidance. The system of placing an order in these shops is ex-

tremely simple. The development engineer's needs are handled by a service man who determines whether a part is of a short-order variety. If it is a rush job and requires less than eight hours for manufacture, it is taken to the leader of a short-order shop who then gives a time estimate for the job. A number is assigned to the order and entered in the log book with all pertinent information. The work is then assigned to a mechanic.

Since their inception, these short-order shops have grown in importance. In the eleven-month period that the first shop was in operation during 1952, more than 3500 jobs were processed that averaged five hours each, with a monthly rate showing a constant increase in volume. The second short-order shop after three months of operation showed an average rate of 300 jobs per month, also with the monthly rate showing a constant increase in volume.

Although the nature of short-order shop operations is such that it is difficult to make a statistical analysis of the time or money saved, the rising demand for this service is convincing evidence of its value.





# Flexible Metal Hose Raises Efficiency of Thread-Rolling Machine

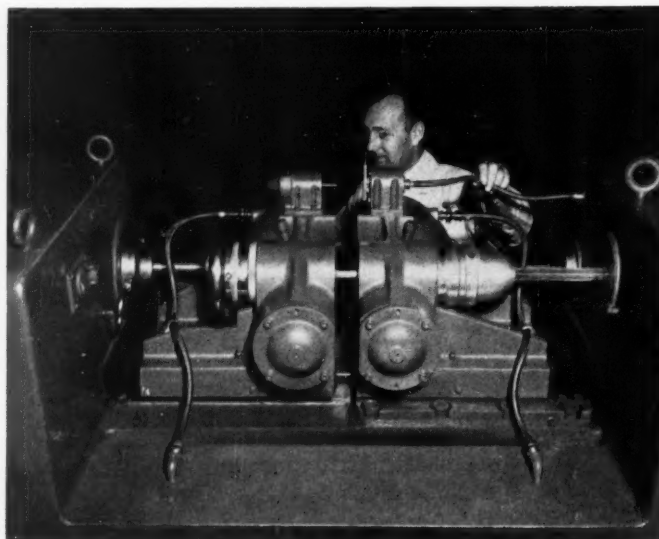


Fig. 1. Two hose lines rising from the bed of the machine carry coolant to the roll housings. Another line, held by operator, is conduit for micro switch.

**F**LEXIBLE metal hose is used extensively in the Model "C" precision thread-rolling machine made by the Watson-Flagg Machine Co., Paterson, N. J. This machine, shown in a close-up view in Fig. 1, can roll Class 5 threads, either by infeed or through feed, and serrate, knurl, and burnish as well. Visible in Fig. 1 are 1/2-inch Titeflex flexible hose lines, which bring the coolant from the pump up to the two roll housings. Another length of hose on the top of the machine serves as an electrical conduit, containing four wires which run from a micro switch on top of one of the roll housings to the control panel of the machine.

A hydraulic system exerts pressure on the forming rolls as they operate, to keep the size of thread constant from piece to piece. The large

line in Fig. 2 is a 3/4-inch flexible hose that connects the hydraulic reservoir to the suction side of the pump. Another line, from the pressure regulator to the pressure gage on the control panel, is made of 3/8-inch hose.

The flexible hose simplifies installation and service disassembly. Being made of metal, it successfully withstands sulphur-bearing coolants. Its tight convoluted inner core and double wire braid enable it to be used at working pressures up to 1000 pounds per square inch.

\* \* \*

## New Film Dramatizes Investment Casting Process

A 16-millimeter sound motion picture film in full color—"Microcast, A Story of Industrial Progress"—was recently produced by the Microcast Division of Austenal Laboratories, Inc. In a running time of twenty-two minutes, the film shows step by step the modern adaptation of ancient civilization's "lost wax" process. The film is available without charge, as are also copies of a sixteen-page reference booklet of engineering and metallurgical data for distribution to the movie audience. For a film reservation card and a descriptive folder, write to the Microcast Division, Austenal Laboratories, Inc., 7001 S. Chicago Ave., Chicago 37, Ill.

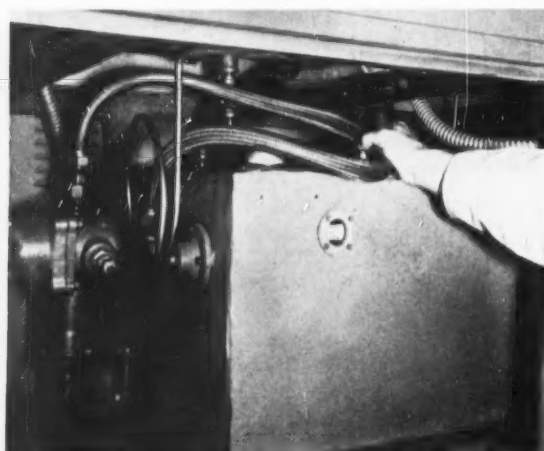


Fig. 2. This line carries hydraulic oil from reservoir to suction side of pump. Assembly of flexible hose is conveniently performed in restricted quarters.

# INGENIOUS *Mechanisms*

Mechanisms selected by experienced machine designers as typical examples applicable in the construction of automatic machines and other devices

## Mechanism for Varying Rotation of Winding Mandrels

By H. B. SCHELL

The mechanism illustrated is designed to vary the rotation of two mandrels on which paper tubes are wound. Paper from the web is wound first on mandrel *A* and then on mandrel *B*. The tube thus produced on one mandrel is stripped off while a tube is being wound on the other mandrel. A completed tube consists of a given number of full turns of paper plus a fraction of a turn as indicated at *a* in diagram X. The means for applying adhesive to the proper portion of the web for securing the lap section of the rolled tube is not shown.

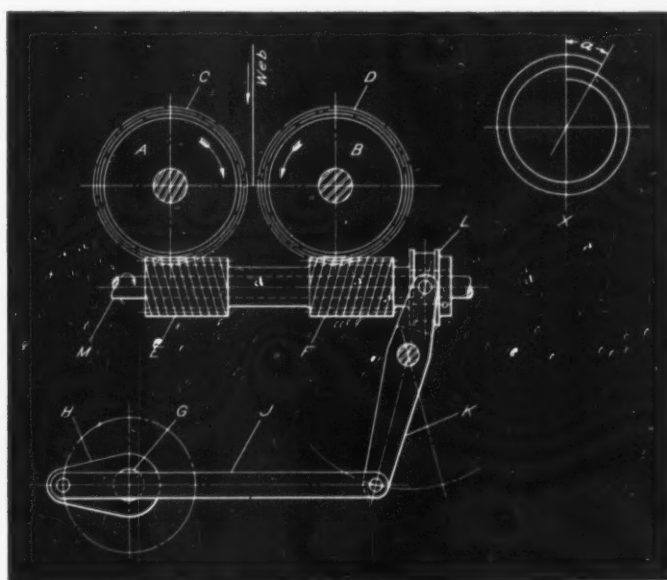
In order to maintain synchronism with the other parts of the machine, the mandrels can only make a specified number of full turns. Therefore, a driving mechanism for the mandrels had to be designed which would give the required number of full turns plus a fraction of a turn *a* on the winding cycle of each roll without increasing the total number of complete revolutions. To accomplish this, it was necessary for

the mandrel being stripped to have its rotation reduced to compensate for the fractional rotation provided for the lap *a* before starting to wind a new tube.

The mandrels *A* and *B*, with their respective worm-wheels *C* and *D*, are driven by worms *E* and *F*. The worm-wheel *C* and worm *E* are right-hand, while the worm-wheel *D* and worm *F* are left-hand. The two worms *E* and *F* are made integral, and are slidably mounted on their driving shaft *M*.

The extra rotational movements of the mandrels are obtained by reciprocating the worms on their driving shaft. A shaft *G*, which makes one revolution for each complete winding cycle of the two mandrels, provides the drive for the worm-reciprocating movement. On shaft *G* is a crank *H* of proper length, which is connected to lever *K* by link *J*. The forked end of lever *K* carries shoes that ride in a groove provided for them in a collar *L*. This part is pinned to a hub at the outer end of worm *F*.

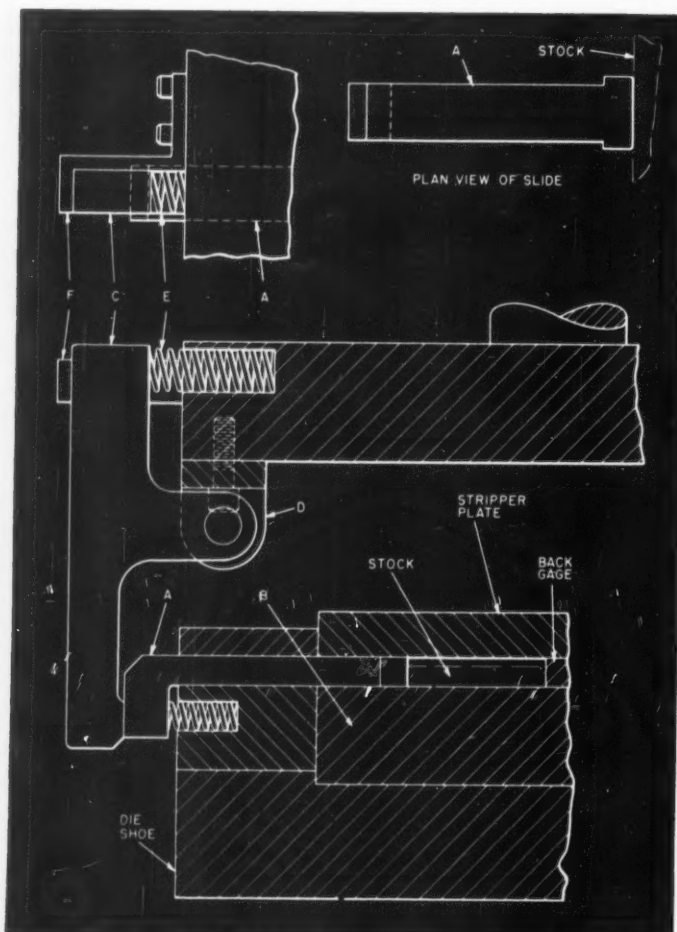
When the machine is in operation, the web is introduced between the mandrels, as illustrated, and is brought into contact, by means not shown,



Mechanism designed to vary rotation of mandrels used to wind paper tubes

with, say, mandrel *A*, to which it is held by vacuum. Mandrel *A* rotates in the direction indicated, winding the paper around it the required number of laps. At the same time, the worms move to the left a sufficient distance to give the required extra part of a revolution. It should be noted that although mandrel *A* is given the additional rotational movement, this same amount is subtracted from the rotational movement of mandrel *B*. Thus it will be apparent that the overlap *a* is the sum of the under speed of the beginning of the winding cycle and the over speed at the end. This does not affect the winding operation, since *B* is being stripped of its previously wound tube during this decelerating part of the cycle.

At the proper point in the cycle, the web is cut (by means not shown) and the leading edge then brought into contact with the opposite mandrel. The axial movement of the worms is reversed on the return stroke of link *J* at the proper time; and the worm *F*, moving in the opposite direction, gives mandrel *B* the additional rotation required for the lap joint.



## Cam-Operated Stock Clamp for Piercing and Blanking Dies

By ROGER ISETTS

Difficulty is often encountered in operating piercing and blanking dies if some means is not provided to keep the stock rigidly pressed against the back gages of the die. This is especially true if a high degree of accuracy is desired. The stock will usually weave when being pushed through the gages, or it will jump when struck by the punches. These conditions are particularly aggravating when handling heavy stock.

To overcome such trouble, a mechanism was designed which automatically presses the stock against the back gage without requiring any effort on the part of the operator. This device also has the advantage of reducing the number of scrapped parts.

Shown in the illustration are two hardened and ground slides *A* mounted in ways at the front of the die-block *B*. These slides are spaced as far apart as possible. The cam *C* swivels in a clevis

bracket *D*, which is screwed and doweled to the top shoe. A spring *E* in the top shoe keeps the cam up against a Z-shaped retainer *F* when the die set is in the open position.

As the press ram descends, the lower end of the cam *C* strikes the angular surface on the slide *A*, forcing the slide up against the stock. Of course, the device must be so designed that the slide is pressed firmly against the stock just before the punches enter the stock. On the up stroke, the slide *A* is retracted, allowing the operator to move the strip easily through the gages.

\* \* \*

A circular slide-rule called a "Qualitrule" has been developed by the American Hydromath Corporation, New York City, as an aid in industrial quality control. This computer in one setting gives the upper and lower limits for the number of defective parts to be expected in a sample of given size. The slide-rule covers sample sizes from 2 to 1000, averages from 0.3 to 20 per cent, upper limits from 2 to 200 units, and lower limits from 0 to 50 units.

Cam-operated clamp for holding stock against back gage of piercing and blanking die

# TOOL ENGINEERING

# Ideas

Tools and fixtures of unusual design and time- and labor-saving methods that have been found useful by men engaged in tool design and shop work

## Pivoting Fixture Used for Milling a Curved Surface

By ROBERT MERY, Staten Island, N. Y.

The illustration shows a work-fixture which solved the problem of milling a curved surface at a time when no tracer-controlled equipment was available. A horizontal machine set up with an arbor type cutter was used for the job.

In principle, a counterweight is employed to change the position of the work on the milling table during the cut. A template of the required curvature—in this instance, a concave surface—is incorporated in the fixture and maintains contact with a follower that rotates with the cutter.

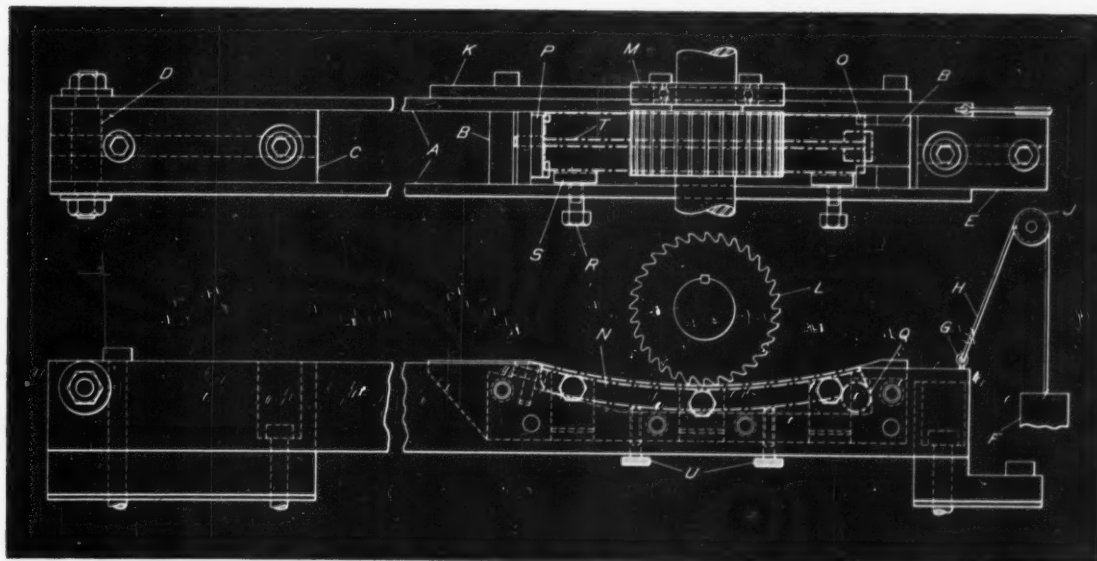
The fixture consists essentially of front and back plates *A* joined together by three spacers *B*. At their left end, the plates are hinged to an anchor *C* by a bolt pin *D*. An alignment block *E* bolted to the table at the other end of the fixture fits the channel between the plates, but is not tied to them. In this way, a counterweight

*F*, connected to an eyebolt *G* by a cable *H* running over a pulley *J* keeps the fixture in a normally raised position.

Attached to the back plate is a template *K* having an upper edge of the required curvature. On the arbor behind the milling cutter *L* and directly over the template is a follower *M*. The follower has the same diameter as the cutter. Actually, the follower is a ball bearing, with its inner race free to rotate at spindle speed while the outer race rolls on the template.

The work *N*, a bracket forging, is nested in the channel between the plates on shoulders *O* of the right-hand spacer and on a bridge piece *P* of the left-hand spacer. The bridge piece is able to swivel to adjust itself to any irregularity of the bottom surface of the forging. After being registered endwise against a locator *Q*, the work is secured by tightening set-screws *R* which operate clamps *S*. A central rib *T* along the convex bottom surface is supported over a pair of screw-jacks *U*.

The cut is taken with a feed of the table to



The counterweight (*F*) keeps the fixture in a normally raised position, so that the template (*K*) is in contact with the follower (*M*)



the left. During the cut, the counterweight keeps the template in contact with the follower, causing the plates to pivot slightly on the anchor at their left-hand end.

## Turret Lathe Flute-Milling Attachment

By CLIFFORD T. BOWER, London, England

The first machining operation on the Diesel engine fuel pump valve shown in Fig. 1 consists of simply turning the part to shape on a turret lathe. Milling the longitudinal flutes *S* on the valve guide section, however, is a more complex problem.

If the valve body is turned to shape completely in the lathe, it is almost impossible to hold it for milling the flutes *S*. The flute milling must be done by traversing an end-mill 3/4 inch in diameter along a path parallel with the longitudinal center line of the valve. The flutes are cut by the blades at the front face of the end-mill, which must break into the small diameter neck *T*. It is necessary that the flutes have the same profile throughout their length. If they are milled in the end of a piece of bar stock, which is later turned and cut off to produce a finished valve, the holding problem is eliminated, since a length of bar stock can easily be held in a collet chuck.

One method adopted initially for producing this valve consisted of cutting off pieces of bar stock to a length sufficient to make two valves. The flutes were first milled on both ends of the bar. Then the bar was gripped in the collet of a turret lathe in which the turning operations were completed.

To eliminate the separate cutting-off and milling operations, it was decided to try producing a completely machined valve on the turret lathe. This offered certain advantages. It eliminated the need for using separate cutting-off and milling machines and the movement and handling of components between machines. Storage space for semi-finished components was no longer required. Also, there was no need for careful balancing of separate production processes because only one machine, the turret lathe, was to be used.

The milling head which was constructed to perform the flute-milling operation on the turret lathe is shown in detail in Fig. 2. The bar stock from which the valves are machined is bright steel 3/4 inch in diameter, and can be seen at *A* protruding from the front of the collet chuck *B*. After being fed out of the collet against a length stop mounted at one station of the lathe turret *C*, the valve guide section *U* is turned to a diameter

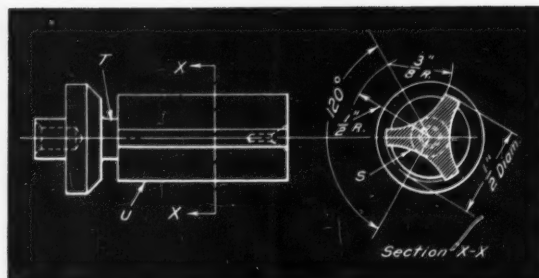


Fig. 1. Fuel pump valve machined on turret lathe equipped with special milling head for producing flutes (*S*)

of 1/2 inch. This operation is followed by indexing the milling head into position.

Extending from the front of the milling head are a pair of spring-backed tubular driving pins *D*, which are forced outward by means of the compression springs *E* housed within each pin. By feeding the lathe turret forward by hand, the front ends of the driving pins can be engaged with a pair of blind-ended holes *F* bored in the front faceplate of the collet chuck. These holes are shown in detail in Sections *X-X* and *Y-Y*. The springs *E* within the driving pins keep them pressed against the bottoms of the holes in the chuck faceplate.

If the lathe collet chuck is set revolving, the driving pins are carried around with it, and since the pins are slidably mounted within holes bored in the block *G*, they also rotate the latter member. Block *G* is mounted in a ball bearing at each end. The stationary exterior races of the ball bearings are fixed in the cylindrical body *H*. This non-rotating body is mounted on the lathe turret by means of a circular plate *I* to which it is fastened by means of socket-head screws. The plate *I* has an integral shank which fits into one of the tool holes in the lathe turret.

Block *G* carries the milling cutter spindle *J*. The latter revolves in bronze liner bushings and is provided with a ball thrust bearing at the cutter end. The axis of the cutter-spindle is eccentrically positioned at a radial distance of 1/2 inch from the axis of block *G* so that the 3/4-inch end-mill *K* will produce the correct shape of flute in the fluted section *U* of bar stock *A*.

The right-hand end of the cutter-spindle *J* (Section *Z-Z*) carries a spur gear *L*. Spindle *J* is keyed to gear *L* and located endwise by means of a threaded collar. The spur gear *L* meshes with the teeth of the internal ring gear *M* which is integral with the stationary body *H*.

It will be apparent that the collet chuck, bar stock, block *G*, and the cutter-spindle with both cutter and gear wheel all rotate when the lathe spindle is started. The center line of the cutter-spindle describes a circle of 1/2-inch radius about

the lathe center line and, since the spur gear teeth are engaged with the teeth of the stationary internal ring gear *M*, causes the cutter-spindle to rotate within its bearings in the block *G*.

The effect could be obtained in a similar manner if the lathe spindle were locked in a stationary position and an independent auxiliary driving means applied to the cutter-spindle in order to rotate it. By utilizing the normal rotating means of the lathe spindle for driving the cutter-spindle, auxiliary driving attachments are eliminated. The construction of the milling head may appear to be unduly complicated, but greater complication and expense would result if an auxiliary motor or drive had to be provided.

To mill the flutes, the driving pins *D* are engaged with one pair of the holes in the chuck plate and the spindle is started. The driving pins connect the lathe spindle and block *G* together, and the cutter-spindle gear revolves, driving the spindle. The lathe turret, with the milling head, is hand traversed toward the work until the revolving end of the cutter *K* makes contact with the end of the bar stock. The automatic feed of the turret can then be engaged and the cutter fed axially along the work. An auto-

matic stop disengages the turret feed in the regular way.

The lathe spindle is stopped and the turret backed away from the work by hand until the driving pins become disengaged from the holes in the chuck plate. The second set of holes is aligned with the driving pins, which are then engaged by traversing the turret to the left, and the cycle is repeated to cut the second flute. Engaging the driving pins in another pair of holes has the effect of moving the cutter-spindle through an arc of 120 degrees around the component.

When indexing the head around the component to engage the driving pins with a fresh pair of holes, the operator must be sure that he moves the driving pins through 120 degrees and not 30 degrees. Study of Section *X-X*, which shows the faceplate of the collet chuck, will clarify this point. If the operator always moves the driving pins clockwise, from Position 1-1 to Position 2-2, he will automatically carry the cutter around the component through an angle of 120 degrees. If he merely shifts the driving pins to the next pair of holes, through 30 degrees, the flute will be milled in the wrong place. An experienced operator soon works out a rou-

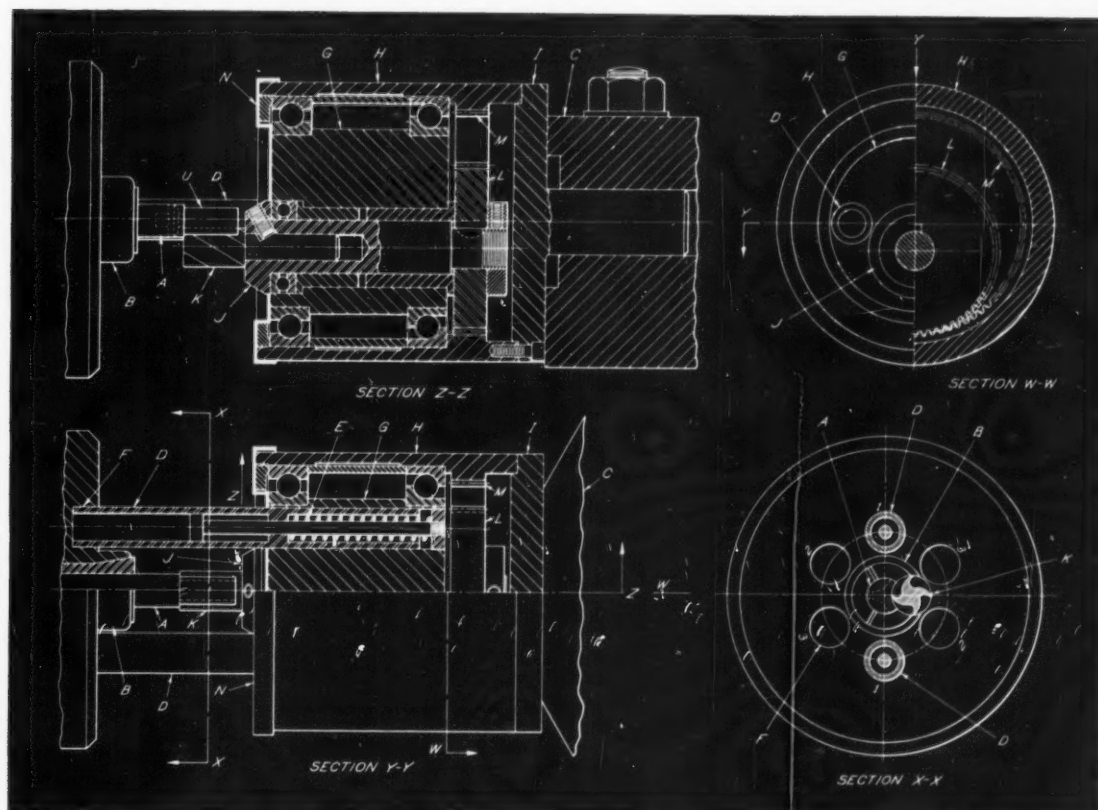


Fig. 2. Special milling head used on turret lathe to produce flutes in fuel pump valve

tine for indexing the head so that very little scrap work results.

The end milling cutter *K* used for the milling job has four spiral teeth that are ground carefully to a high rake angle on the front face. It has been found that the cutter can be revolved at a surface speed of 120 feet per minute. With a feed of approximately 2 inches per minute, this gives an eight-hour life between grinds.

Coolant is flooded on the work but to prevent it from entering the ball bearings and spindle bushings, a sheet-metal cover *N* is secured to the front face of the block *G*. The cover has holes cut through it to allow the driving pins and cutter-spindle to protrude.

After the three flutes have been milled, the valve is machined completely by means of the turning tools and then cut off. Apart from a secondary lathe operation of centering and tapping, the valve is completely finished, ready for heat-treatment and subsequent grinding.

### Height Comparator Employs Standard Micrometer Head with Special Body

By THOMAS J. BIZZOCO and  
CHARLES A. SMITH, New York City

A quick-setting height comparator of versatile use in the machine shop, tool-room, and inspection department is seen in Fig. 1. It incorporates



Fig. 1. The height being measured can be transferred to the comparator by means of a dial indicator

a commercially available micrometer head with a specially designed body having a series of measuring surfaces spaced 1.000 inch apart.

In the illustration the man at the right is showing how the device can be used to measure the height of a surface. First, a surface gage on which is clamped a dial indicator is positioned on the reference base of the object and the indicator is set to read zero at the height to be measured. Next, the surface gage is positioned near the comparator, which is then adjusted

by turning the thimble of the micrometer until the indicator again reads zero over one of the measuring surfaces.

With the micrometer fully closed, each of the measuring surfaces is at a precise inch-unit distance above the base of the comparator. Thus, by adding the reading of the micrometer head to the inch distance of the measuring surface on which the indicator bears, the height is obtained.

Alternately, the comparator can be set at some desired height, and the indicator used to transfer the reading to the work or tool. A vernier on the micrometer head permits settings to be made to 0.0001 inch.

The design of the comparator can be seen in Fig. 2. It consists of base *A*, a support column *B*, a post *C*, and a crown *E* which contains the micrometer head *F*. The spindle can move vertically in the crown and base. In the bottom end of the post, which is hollow, is a spring to maintain the post in contact with the end of the micrometer spindle.

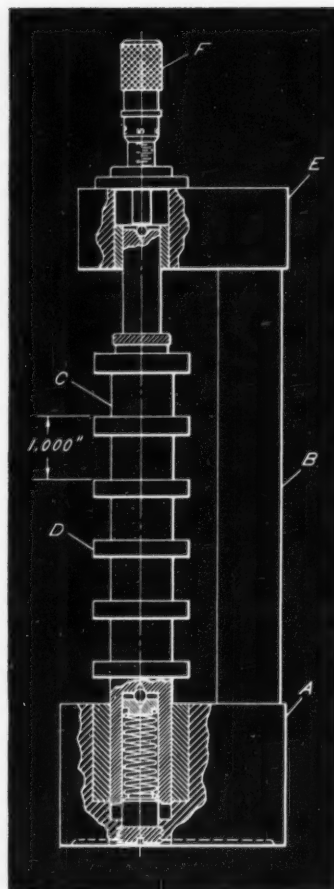


Fig. 2. The series of measuring surfaces (*D*) enables a single micrometer head (*F*) to measure any height within the range of the comparator



# The Place of the Tool and Die Shop in Industry Told on Film

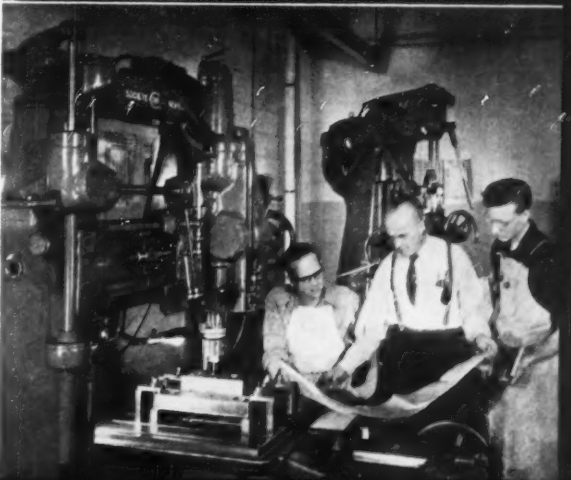
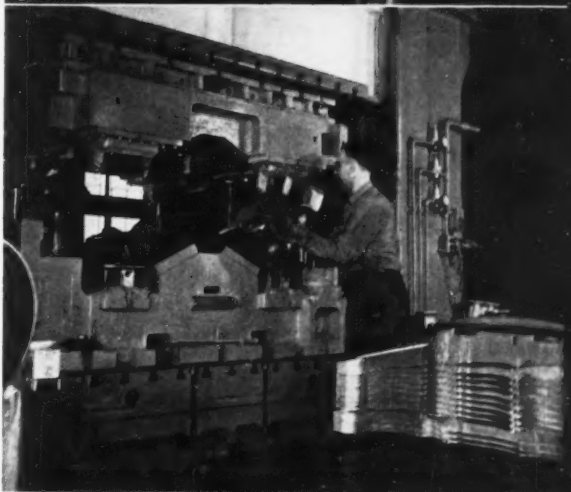
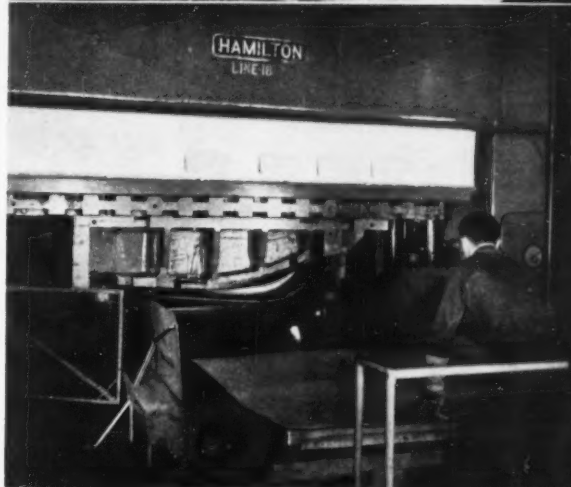
**T**HE vital part played by contract tool and die shops and their skilled craftsmen in supplying the special tools and dies that permit industry to produce in quantity is emphasized in a 16-millimeter color-sound film prepared by the National Tool and Die Manufacturers Association. All sequences were filmed at tool and die shops and leading production plants in the East and Midwest.

Various steps in the making of tools are depicted, and then the application of the same tools in the quantity manufacture of household appliances, automobiles, munitions, and so on. Lathes, drilling machines, shapers, forming presses, and other machine tools are seen at work, and various types of gages and other inspection devices are shown being applied to insure the extreme accuracy required in tools and dies. These typical shop views are tied together with interesting flashes of the products that are possible because of tools and dies, and of people putting the products to use.

After pointing up the significance of the fact that the accurate interchangeable parts essential to low-cost mass production are dependent upon precise tooling, the film shows how progressive shops are training the skilled help of the future. It traces the progress of an actual apprentice in a New England shop, showing him operating various machines, studying blueprints, working out problems with the use of a handbook, and mastering the techniques required in tool and die making. The point is brought out that his training is equivalent to that of a man who earns a college degree (with the added advantage of earning while learning), and that the journeyman tool and die maker holds a position that commands both respect and high pay.

This moving picture, "Tool and Die Making—Keystone of Mass Production," which has a running time of twenty minutes, will be shown in the twenty-three tooling centers of the Association throughout the country. Prints of the film will be available to engineering societies, schools, industrial concerns, and other organizations through the National Tool and Die Manufacturers Association, 907 Public Square Bldg., Cleveland 13, Ohio.

**Shots from a film on toolmaking produced by Farrell & Gage Films, Inc., under the supervision of Fred Wittner Advertising, public relations counsel for the National Tool and Die Manufacturers Association**







# The Sales Engineer and His Problems

By BERNARD LESTER  
Management Consulting Engineer  
New York

## Wanted—A Sales Manager

**T**HE demand for able sales managers is never satisfied. Consultants frequently get requests from presidents of manufacturing concerns like this: "The position of sales manager will soon become vacant. We see no likely candidate within our organization. Can you recommend a man for the job? Our requirements are these . . ." Then follow specifications almost as exacting as those for a special herringbone gear.

Disregarding the shortcomings of management that cause such unpreparedness, let us consider what any sales engineer should deliberate on to determine whether he would make a suitable candidate for the manager's job.

Fortunately, individual qualities and ambitions differ. Many prefer to be top-notch sales engineers in their own right, rather than take on executive duties. Star salesmen do not necessarily make good sales managers, just as good sales managers may not qualify as star salesmen. Life's rewards come from the proper relation of man to job.

For the sales engineer who is ambitious to be a sales manager, there is a reasonably accurate course for development. A route of navigation intended to help avoid reef and shoal, and to reach the desired port, will here be charted.

1. Improve ourselves right in the selling job we now hold. It's an underlying fact that men are chosen for bigger jobs because they have done smaller jobs well. Analyze carefully, evaluate judiciously, plan effectively, and act both individually and cooperatively. Are we developing as broad-gage men? For certainly none of us qualify to lead others unless we can manage our own affairs.

2. Develop particularly our aptitude for cooperation with others in the company to reach a common goal. We frequently hear, "Yes, he's a go-getter, but pretty much on his own" and less

often, "he's aggressive and also a good all-round company man."

3. Study the company operations, and widen our scope by being keenly interested in what's going on within the company, where it is headed, and what improvements can be made in products, organization, and performance.

4. Develop the habit of making constructive suggestions. Capable management earmarks men who present practical ideas for improvement.

5. Develop a breadth of interest by focussing on the various statistical changes taking place in the business world that will affect the company's progress. For instance, think in terms of markets and their growth or decline; buying trends; interest rates; customers' inventories; and direct and indirect competitive activities bearing on the future. In short, develop an astuteness to factors that influence change.

Read a few management magazines as well as trade magazines of direct interest. Study a few books on corporate organization, sales management, and buying and selling.

6. Make the study of people a habit of mind, and become familiar with what makes a live sales organization tick. Concentrate on the human aspects of buyers and all the sound arts of sales promotion that can make our company, our product, and our service stand out above all the rest.

7. Make our desires regarding advancement known to the right man in the company, at the right time. But acknowledge the necessities of time, experience, and training.

When we assemble facts on sales managers who have failed, the scoreboard is something like this:

Lack of ability to work with others in a friendly fashion. Too many sales managers either try to assume other men's duties, or

persist in bossing instead of helping and leading.

Lack of balance between analysis and action. Some sales managers excel in facts and figures, but can't select essentials and reach speedy conclusions. Others actively promote plans and policies supported largely "by hunch."

Failure to gain the support of headquarters officials—those responsible for de-

sign, production, finance, and procurement—as well as to weld the field sales force to the rest of the company.

Few sales managers are lazy. But many reach a state of irritable nervous exhaustion either from the wear and tear of entertaining or the effort wasted on non-essentials.

Want to be a sales manager? If so, consistently prepare for the job by considering such shortcomings as these.

## Lewis K. Sillcox Nominated for Presidency of the A.S.M.E.

**L**EWIS K. Sillcox, vice-chairman of the board of the New York Air Brake Co., has been announced the 1954 nominee for president of the American Society of Mechanical Engineers. Nomination is equivalent to election by letter ballot of the membership prior to the annual meeting in November.

Mr. Sillcox, who lives in Watertown, N. Y., has been identified with the transportation industry since he started his career in 1903 as a railroad foundry apprentice. From 1918 to 1927, he held the position of general superintendent of motive power of the Chicago, Milwaukee & St. Paul Railroad, and in 1927 became first vice-president of the New York Air Brake Co. In 1948, he was elected executive vice-president and in 1952, vice-chairman of the board.

The nominee for president, who is a Fellow of the American Society of Mechanical Engineers, has been an active member since 1916. He was awarded the A.S.M.E. Medal for distinguished service in engineering and science in 1943, and in 1946 was made an honorary member.

Members nominated to be regional vice-presidents are as follows: Willis F. Thompson, vice-president, Westcott & Mapes, New Haven, Conn.; Professor William G. McLean, head of the Department of Mechanics, Lafayette College, Easton, Pa.; Thompson Chandler, chemical engineer, Carbide & Carbon Chemical Corporation, South Charleston, W. Va.;

Vernon A. Peterson, district manager, Elliott Co., Los Angeles, Calif.; Professor Clifford H. Shumaker, director of the Institute of Management, Southern Methodist University, Dallas, Tex.

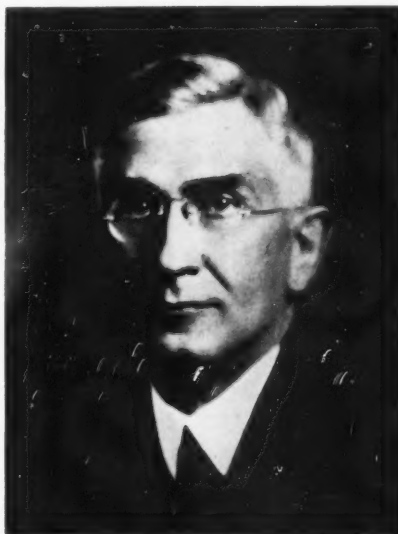
Nominees for directors-at-large are Frank L. Bradley, plant engineer, Forstmann Woolen Co., Passaic, N. J.; and Robert B. Lea, Sperry Corporation, New York City.

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### Booklet for Prospective Manufacturers

A booklet offering practical guidance to the prospective small business man planning to start or buy a manufacturing plant was announced recently by the Small Defense Plants Administration. The booklet, "One Hundred and Fifty Questions for a Prospective Manufacturer," was prepared by Associate Professor of Small Business William M. Hoad, University of Michigan, in cooperation with SDPA. The booklet can be purchased from the Superintendent of Documents, Washington 25, D.C., for 20 cents.

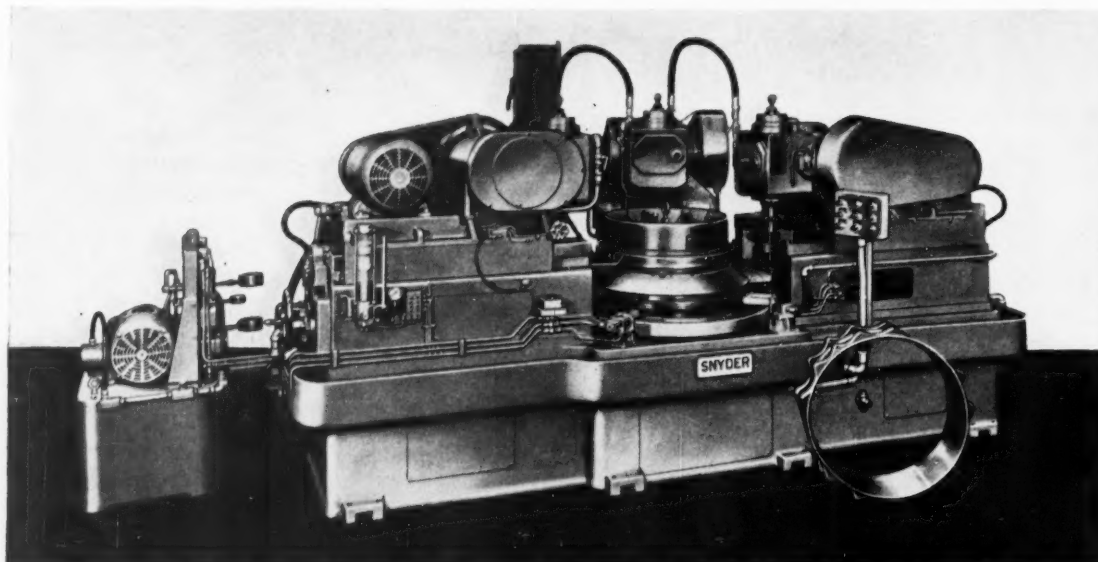
The booklet raises questions and suggests lines of inquiry covering fourteen broad subjects, including personal ability; organization; production; financing; insurance; location; plant equipment and lay-out; production planning and contracting; purchasing; personnel; packaging; marketing; and records, costs, and pricing. Suggestions for further study are given.



Lewis K. Sillcox, who has been nominated president of the A.S.M.E. for 1954

## LATEST DEVELOPMENTS IN

# Shop



Automatic rotary table machine for processing jet-engine parts, built by the Snyder Tool & Engineering Co.

### Snyder Automatic Machine for Processing Jet-Engine Compressor Casings

The Snyder Tool & Engineering Co., Dept. M, 3400 E. Lafayette, Detroit 7, Mich., has announced an automatic machine designed for processing jet-engine compressor rings. The compressor ring processed by this machine is a thin-walled cylinder made from one of the tougher stainless steels. It has four rows of lugs projecting from the outer surface like fins. These lugs can be seen in the view of the compressor ring shown in front of the processing machine in the illustration. The operation consists of profiling the lugs by milling to a maximum depth of 1 3/8 inches. The milling is done in three steps, two roughing cuts and one finishing cut.

The machine is equipped with a fixture mounted on a rotary table driven by a hydraulic fluid motor. Spaced around the table are three

way type milling units, each controlled by a Turchan follower hydraulic duplicating system. One of the units performs the profiling operations on all four rows of lugs and the other two units cut off some of the lugs at different intervals to complete the finished part.

The fixture locates the part from an outside diameter at one end and clamps and thoroughly supports the part by means of four expanding jaws on the inside diameter of the part. Four toe-clamps are provided to hold the part down in the pilot ring. The tracer valve for the Turchan system projects from the front of the unit between the ways. In the advance position it contacts a template which is mounted on the rotary table immediately beneath the fixture.

When the work-piece is positioned in the fixture and the starter button depressed, all three milling units begin their rapid advance. The feed of the profile unit is engaged before the cutter contacts the work. The profile unit continues to feed in until the follower on the tracer valve has contacted the template and the table begins to rotate. Meantime, the other two units have traveled in until the followers of their tracer valves have come in contact with their respective templates.

The first rough cut is completed in one revolution of the work. All three milling units are adjusted to retract the tracer valve in such a manner that the cutter will have the correct amount of infeed on the next cut. This cycle is repeated. The finishing cut is then taken on the third cycle. The total

# Equipment

Machine tools, unit mechanisms, machine parts, and material-handling appliances recently placed on market

Edited by FREEMAN C. DUSTON

time cycle including loading and unloading is about two and one-quarter hours.

The toughness of the work-piece material makes sturdy construction of the machine necessary, particularly the rotary table. There is a speed reduction of about 240 to 1 between the fluid motor and the table, obtained through two cone worm speed reductions. A split worm-gear removes all backlash from the table movement.

The rotating speed of the table controls the feeding rate of the machine. The feed is varied automatically during the profiling operation by a tracer valve on the profile unit. Whenever this unit

has to make a rapid radial motion, the speed of the table is reduced. The average table speed is about 3 inches a minute.

The milling units consist primarily of a vertical spindle supporting four cutters driven

through a cone worm drive and change-gears. The hydraulic cylinders that advance the milling units on the ways are made relatively large in diameter in order to accurately control the profiling operation.

## Universal "Burr-Master" Gear-Chamfering Machines

A line of universal high-speed gear burring and chamfering machines is being introduced by the Modern Industrial Engineering Co., Dept. M, 14230 Birwood Ave., Detroit 4, Mich. The machines in this line are designed to burr and chamfer the entire tooth form of both helical and spur gears having

pitch diameters ranging from 5/8 inch to 9 1/2 inches. They will also burr and chamfer external straight and involute formsplines. In Fig. 1, the operator is shown loading a helical gear for deburring and chamfering the complete tooth form, including both sides and root. The machine begins cut-



Fig. 1. Loading a "Burr-Master" gear-chamfering machine made by the Modern Industrial Engineering Co.

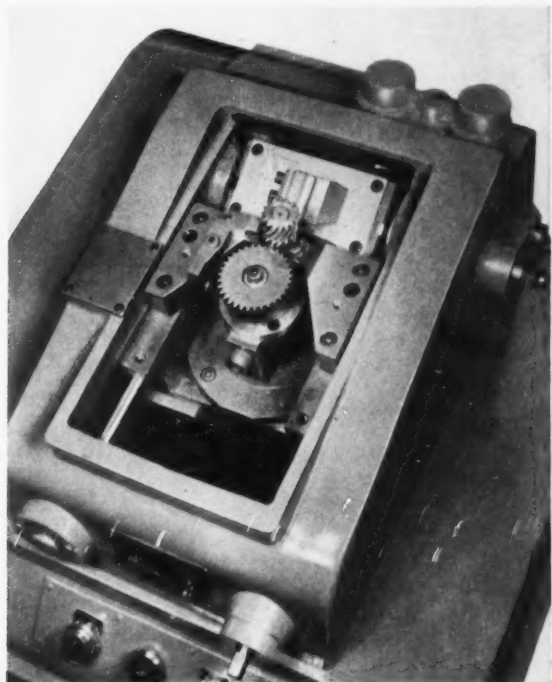


Fig. 2. Close-up view of the machine shown in Fig. 1 with safety cover removed to show tooling



ting as soon as the gear drops into position and finishes more than 600 gears per hour on one side.

The simplicity of the tooling, permits rapid change-over from one part to another, normally requiring only ten minutes. The tooling, shown in Fig. 2, consists of a pilot gear, work-holding fixture, tool-block, and form cutter. The tooling is developed for the gear to be burred and chamfered, and is precisely located on the mounting faces of the machine. Once the tools are tried out on a master machine in the manufacturer's plant, they can be applied by an unskilled operator in the customer's shop with equally good results.

Positive positioning of the precision-ground tool-holder is assured by nests and by keying in two directions. Four socket-head screws hold the tool-block in position and make mounting or dismounting a simple task. The work-holding fixture is located on the fixture-mounting rails, posi-

tioned over hardened and ground dowels.

The machines are belt-driven by a 1/2-H.P. motor, two motors being used on the two-station machines. An overriding clutch in one of the pulley hubs prevents damage to the cutter or machine in the event of jamming. A safety cover eliminates any possibility of injury to the operator during loading or unloading of the parts. An electrical control panel at the side of the machine contains both the reversing control and the timing adjustment. Flipping the selector switch of this control reverses the direction of rotation of the index gear. The timing cycle is adjusted by a single screw.

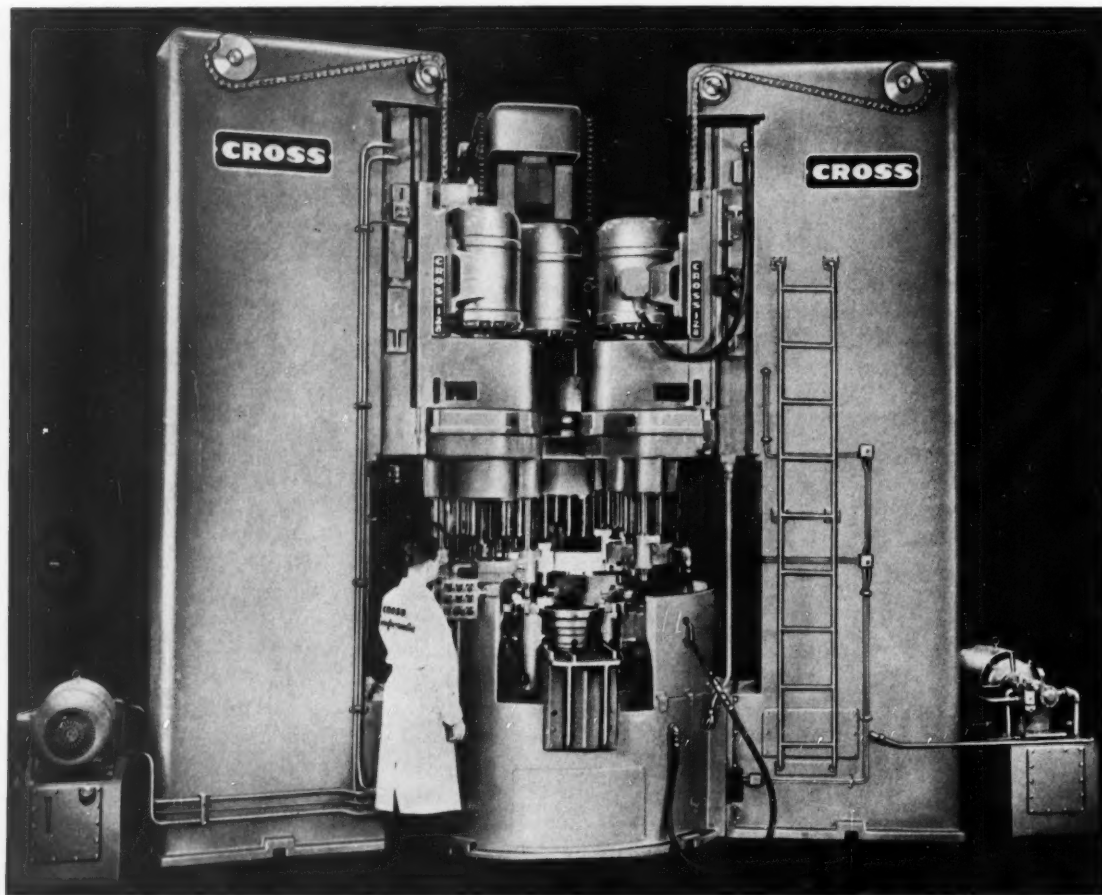
Once the tooling for a particular

gear is mounted in the machine, the operating cycle is simple. Placing a gear on the work-spindle activates a cycle indicator arm that starts the cycle timer, which upon completion of the cutting cycle energizes the cycle indicator light, notifying the operator that the part is completed. The index spindle gear assembly is designed to automatically compensate for gears that run out-of-round or are over size as much as 0.020 inch. This feature enables the machine to deburr and chamfer such gears without affecting the operating cycle. If desired, the machine can be set to chamfer a gear deeper on one side than on the other. The depth of the cutting stroke is infinitely adjustable between limits.

### Cross Machine for Drilling and Reaming Diesel Locomotive Cylinder Heads

A special machine for drilling and reaming Diesel locomotive cylinder heads has been announced

by The Cross Company, Dept. M, Detroit 7, Mich. This machine has seven stations and is designed to



Machine built by The Cross Company for drilling and reaming Diesel locomotive cylinder heads

finish the cylinder heads at the rate of fifty per hour at an operating efficiency of 100 per cent.

The first station is used for loading and unloading, the second for drilling thirteen holes, the third for drilling eleven holes and spot-facing one hole, and the fourth for drilling twelve holes. The fifth station is equipped for drilling two holes and core-drilling and chamfering three holes. The sixth station is employed for

reaming nine holes, chamfering six holes, and forming two spherical seats. The seventh and last station is set up for reaming nine holes, chamfering one hole, and forming two spherical seats.

The machine is equipped with a fluid motor-driven indexing table. Other features include hydraulic feed and rapid traverse, hardened and ground ways, and automatic lubrication. Construction is in accordance with J.I.C. standards.

### Diamond Open-Back Inclinable Punch Press

Continuous or single-stroke operation is available on the redesigned 15-ton open-back inclinable punch press with shut die height of 9 inches manufactured by the Diamond Machine Tool Co., Dept. M, 3429 E. Olympic Blvd., Los Angeles 23, Calif. This press was redesigned to meet the strict safety codes adopted throughout the country. A metal guard completely covers the flywheel.

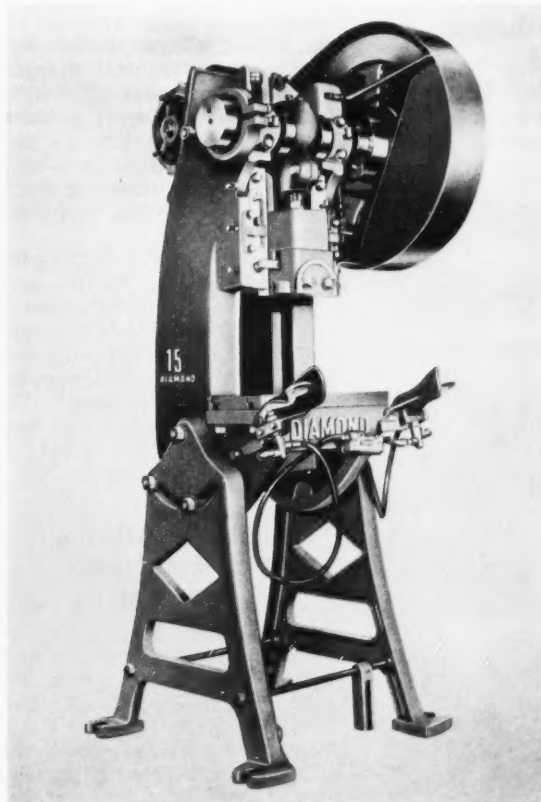
The machine frame is a Meehanite casting and has a large safety factor. This casting is

properly aged under natural conditions, and is designed to meet rigid specifications of strain gage analysis with radii located to properly distribute stress concentrations. The standard stroke is 2 inches. The bed is 8 by 15 3/8 inches and the total length of the gibs is 11 3/4 inches. The press is made in plain open-belt style for operation at a speed of 125 strokes per minute and back-g geared for a speed of seventy strokes per minute. A 1 1/2-H.P. motor is recommended for use with this machine.

### Rotomatic Surface Grinders

The Standard Electrical Tool Co., Dept. M, 2500 River Road, Cincinnati 4, Ohio, has enlarged its line to include 10-, 12-, 14-, 16-, and 18-inch Rotomatic surface grinders. These automatic, high-production machines are hydraulically and electrically controlled for a complete grinding cycle. The switch panel provides a separate optional control of the grinding spindle, work-spindle, coolant pump, and of the magnetic chuck in wheel dressing.

Equipment includes a 7 1/2- or 10-H.P. precision motorized grinding spindle constructed to withstand heavy end thrust. The spindle is arranged for either a cylinder type steel-back grinding wheel or a segmental wheel chuck. Structural steel grinding wheel guards are supplied, and there are graduated handwheels for making independent vertical adjustments. The grinder head is actuated on the hydraulic lift column which has neoprene bellows protection. An adjustable stop controls the depth of grinding cut.



Improved single-stroke open-back inclinable punch press built by Diamond Machine Tool Co.



Rotomatic high-production surface grinder built by the Standard Electrical Tool Co.

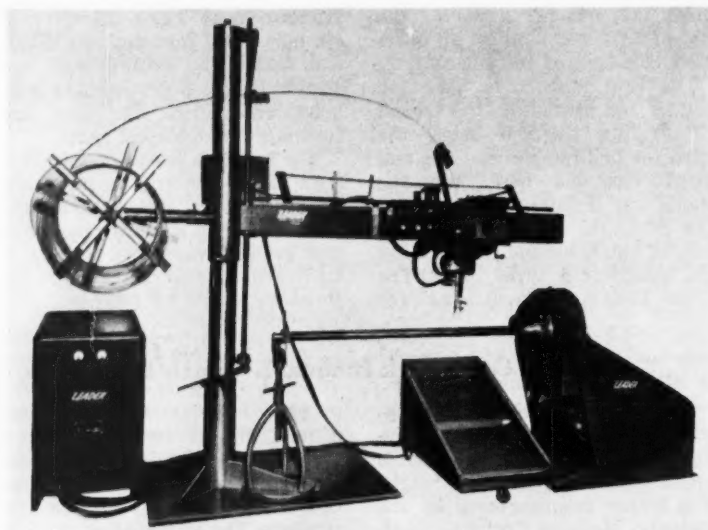
The chuck spindle has a built-in rotary magnetic chuck operated by a rectifier inside the base. The equipment includes motor drive to work-spindle, a motorized hydraulic pump, and a motor-driven coolant pump with hydraulically controlled coolant nozzle.

The Rotomatic is available with a high-speed precision internal grinding spindle; grinder head and feed having graduated swivel mounting; ASSN spindle nose; rotary table or work-holders; and lathe, collet, air, or hydraulic chucks.

### Leader Heavy-Duty Automatic Welding Machine

The Leader Welding & Mfg. Co., Dept. M, 2418 Sixth St., Berkeley 2, Calif., has announced the development of a Model 650 automatic welding machine for use in job shops, in steel mills, and wherever mining or rock-crushing equipment is employed. It has a finger-tip control panel and dual rod-reel holders.

The motorized 20 to 1 ratio, 8-foot cross-arm has a side beam carriage. The pedestal can be rotated through 360 degrees. The automatic welding head is complete with assorted contact tips, tip extensions, and adjustable rod feed rollers. Automatic and man-



Automatic welding machine developed by the Leader Welding & Mfg. Co.

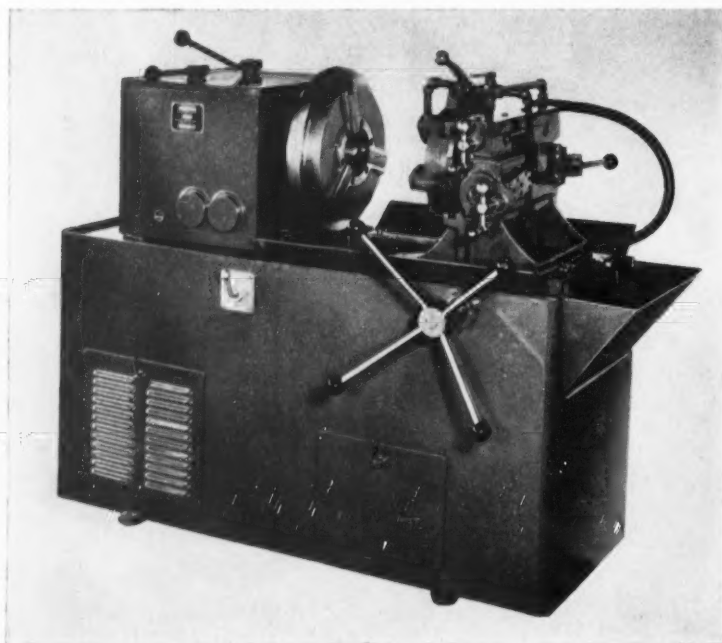
ual bead-lapping control is provided, and the carriage is equipped with an "angling" device for the welding head.

### Oster "Thrift Model" Pipe-Threading Machine

The Oster Mfg. Co., Dept. M, 2057 E. 61st Place, Cleveland 3, Ohio, has brought out a low-cost pipe-threading machine design-

nated as the No. 784 "Thrift Model." This heavy-duty floor type machine of fabricated steel construction has a standard range for threading 1-inch to 4-inch pipe and an extra range for 1/2- and 3/4-inch pipe. It is equipped with a front chuck which requires no wrench, and is especially adapted for use where frequent changes of pipe sizes are necessary. A spin of the handwheel serves to move the gripping jaws through the entire capacity range in a few seconds. The rear centering chuck is of the quick-acting and non-binding type.

A magnetic starter with push-pull selector switch for run and jog, controls the 3-H.P. heavy-duty, 1800-R.P.M. motor. The machine has four lever-controlled spindle speeds. Two quick-opening detachable lever-operated die-heads cover the entire pipe and bolt range and are adjustable for over- or under-size threads.



Oster heavy-duty threading machine for pipe from 1 to 4 inches

### Fafnir Self-Aligning Airframe Control Bearings

A new series of high-capacity, self-aligning airframe control bearings is now being manufactured by the Fafnir Bearing Co., Dept. M, New Britain, Conn. These bearings, designated the DSRP Series, have a full complement of barrel-shaped rollers, one-piece inner and outer rings, and the Fafnir Plya-Seal. Hardened back-up rings provide positive



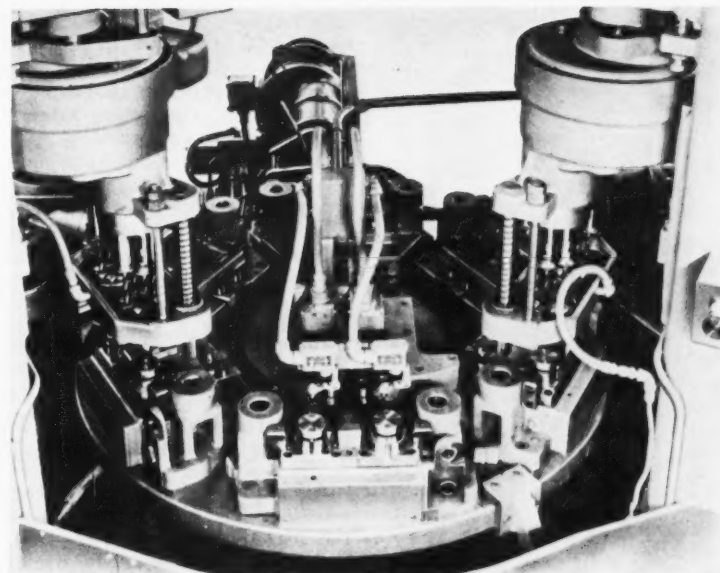
shoulder stops at extreme misalignment positions, yet allow for a full total misalignment of 20 degrees.

### Machine for Processing Steering-Gear Pistons

An automatic six-station indexing type machine designed to drill, ream, mill, and countersink steering-gear pistons at the rate of 440 per hour has been built by Turner Brothers, Inc., Dept. M, 2625 Hilton Road, Ferndale, Mich. Special type fixtures and multiple-spindle heads make possible the high production rate.

An unusual feature of the fixture and clamping mechanism is the dead-center indexing table and stationary cam track. Rollers, attached to the fixture clamping mechanism, are actuated by the stationary cam as the table indexes from station to station. Limit switches, also attached to the center, make it impossible for the machine to operate unless the parts are clamped in place.

The multiple-spindle heads have guide pins that enter bushings in



Machine for the rapid processing of steering-gear pistons brought out by Turner Brothers, Inc.

the fixture before the actual machining operation takes place, thus insuring high accuracy.

### Horizontal Gear-Shaving Machine

A horizontal gear-shaving machine recently completed by David Brown Machine Tools Ltd., Manchester, England, is being introduced in this country by Morey Machinery Co., Inc., Dept. M, 410 Broome St., New York 13, N. Y. This machine, the "David Brown-

Muir S24H," is built to shave gear-tooth profiles of turbine pinions ranging from 4 to 24 inches in diameter and up to 100 inches long.

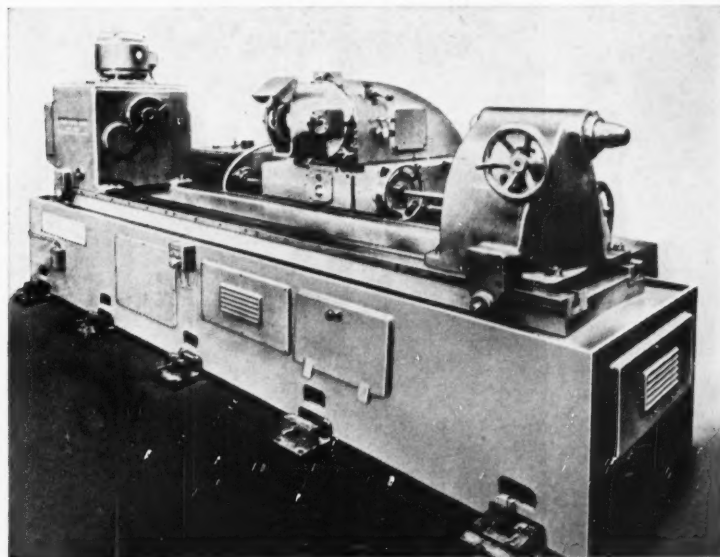
Although designed to employ the radial loading method, whereby both flanks of the gear tooth

are cut simultaneously, the cutter-spindle can be fitted with an oil-cooled brake to allow single-side or selective shaving. Ways on the main bed provide means for locating the driving head and tail-stock, and for the saddle that carries the shaving cutter-head.

Provision is made for the installation of work-steadying brackets in any required position. Complex drives are eliminated by the adoption of independent driving units for both the work driving head and the cutter saddle traversing mechanism. Angular adjustment of the shaving cutter-head is made by a hand-operated worm and worm-wheel. A vernier scale is provided to facilitate quick and accurate setting. The final fine adjustment is achieved by the use of a dial indicator which is in contact with a setting bar located by a slipping ring in the cutter-head.

The work drive head is fixed to the bed, and is powered by a constant speed 5-H.P. motor. Change-gears give a choice of spindle speeds from 21 up to 300 R.P.M. For setting purposes, the driving spindle can be run independently of the other members.

The machine illustrated weighs 20 tons. Other machines in this line include a model for shaving pinions from 4 1/2 to 48 inches in diameter, a second machine for sizes up to 100 inches, and a third machine will take pinions up to 200 inches in diameter.



Horizontal gear-shaving machine introduced in this country by the Morey Machinery Co., Inc.





Rectifier type direct-current welder

### Direct-Current Rectifier Type Welder

The National Cylinder Gas Co., Dept. M, 840 N. Michigan Ave., Chicago 11, Ill., has added a direct-current rectifier type welder to its line of Sureweld equipment. This model is available in 100, 200, 300, 400, and 600 amperes. Both the static and transient electrical characteristics of these ma-

chines tend to produce an unusually stable and easily handled arc. The output current is said to have a pronounced alternating-current ripple that reduces arc blow.

A three-phase transformer supplies the alternating-current power to a full-wave selenium oxide type rectifier which changes this power into the direct current used for welding. Built integrally with the transformer is a reactor circuit, including a saturable core. A variable rheostat or optional

hand- or foot-operated rheostat for remote control permits varying the core saturating current, and thus the output of the welder.

Cooling air, directed by baffles, is drawn in two separate paths through the rectifier stack and the transformer by a fan. Temperatures of all windings are held below the 90-degree C. rise permissible for Class B insulating materials. For added protection, a thermostat on the rectifier stack checks any abnormal heating.

### Mir-O-Col Automatic Wheel and Pulley Rebuilder Utilizing Submerged-Arc Welding Principle

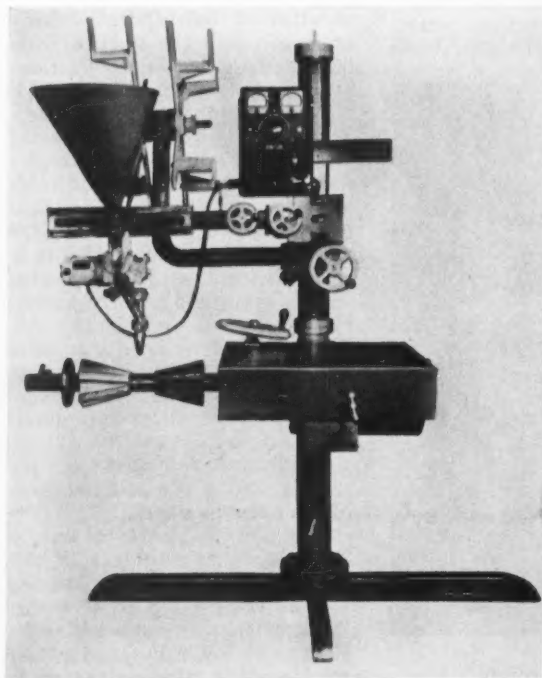
An automatic wheel and pulley rebuilder has been announced by the Mir-O-Col Alloy Co., Dept. M, 312 North Ave. 21, Los Angeles 31, Calif. This machine can be used by shops to rebuild wheels, pulleys, track rollers, idlers, and cones. The machine will handle work of any size up to 40 inches in diameter, and will weld 30 inches of bead per minute. It will accommodate work of any shape and takes all types and sizes of automatic welding wire up to 1/4 inch in diameter.

Features of this machine include an adjusting wheel which permits making fine vertical adjustments of 1/64 inch; a simple

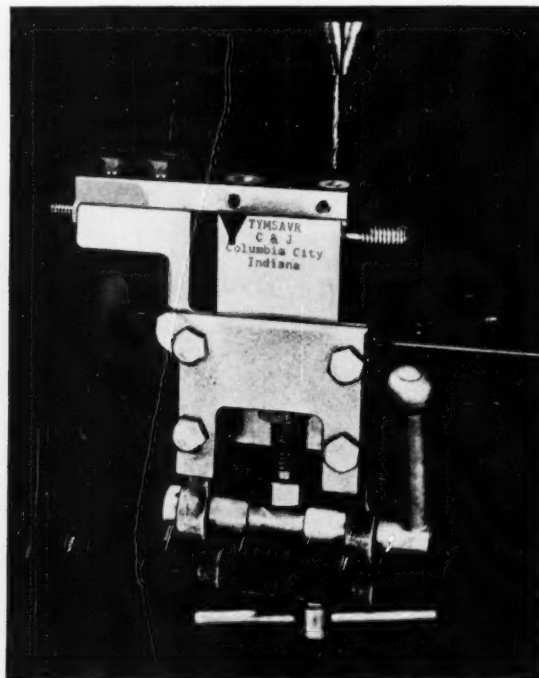
lock on centers that prevents slippage and insures concentric build-up; and a gear reducer on the motor that permits variable spindle speeds from 1/4 to 3 R.P.M. The welder utilizes the submerged-arc principle of automatic welding.

### Work-Holding Fixture for Cross-Hole Drilling Operation

A cross-hole drilling fixture called the "Tymsavr" has been introduced by C & J Screw Machine Products, Inc., Dept. M, 445 South Line St., Columbia City, Ind. The fixture can be quickly



Mir-O-Col automatic wheel and pulley rebuilder



Work-holding fixture for cross-hole drilling fixture

clamped to the swing table of an ordinary drill press, thus providing a standard set-up for almost any production cross-drilling job, eliminating the expense and loss of time involved in having cross-drilling fixtures designed and made for such drilling operations.

The fixture has two hole drilling positions in the bushing plate

which accommodate hardened drill bushings up to 3/8 inch in size. An adjustable end-stop positions the work lengthwise. Extra long pieces of stock can be placed crosswise in a channel cut across the V-block at the rear drill bushing position. The fixture will handle stock from 3/16 inch up to 1 inch in diameter.

### Web-Thinning Attachment for "Cawi-Spiral" Twist Drill Grinder

Web-thinning in addition to drill grinding operations can now be performed on the "Cawi-Spiral" twist drill grinder, described in *MACHINERY*, December, 1951, page 210. This is made possible through the use of an attachment introduced on the American market by the Kurt Orban Co., Inc., Dept. M, 205 E. 42nd St., New York 17, N. Y. Web-thinning operations are performed on a second grinding wheel regularly used for manual web-thinning on all existing "Cawi-Spiral" grinders.

A feature of the attachment is an indexing device operated through a push-button which turns the chuck and drill, after thinning one side of the web, for

correctly grinding the opposite side of the web. Only one chucking operation is needed for both grinding and web-thinning.

Provision is made for tilting the attachment to conform with

the lead of the drill and for adjusting the depth of the web-thinning grinding cuts. Adjustments are provided for angular setting of the drill with respect to the grinding wheel and for raising or lowering the chuck to conform to the length of the drill. The attachment can be moved parallel to the machine spindle.

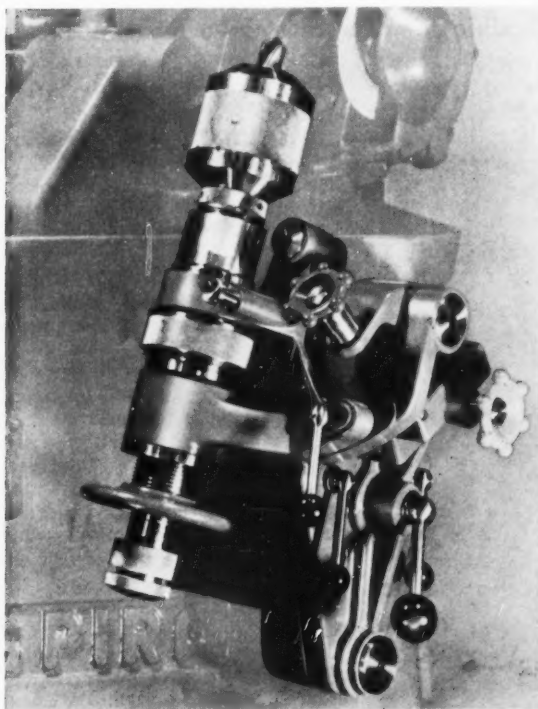
The "Cawi-Spiral" grinder, for which this attachment is designed, uses a planetary gear system for grinding two- and three-lip drills. Two chucks handle drills from 0.028 to 3/16 inch and 5/16 to 1 inch in diameter. The web-thinning attachment will be demonstrated in Booth No. 2308 at the National Metal Exposition to be held in Cleveland October 19 to 23.

### Pines Air-Operated End-Finishing Machine

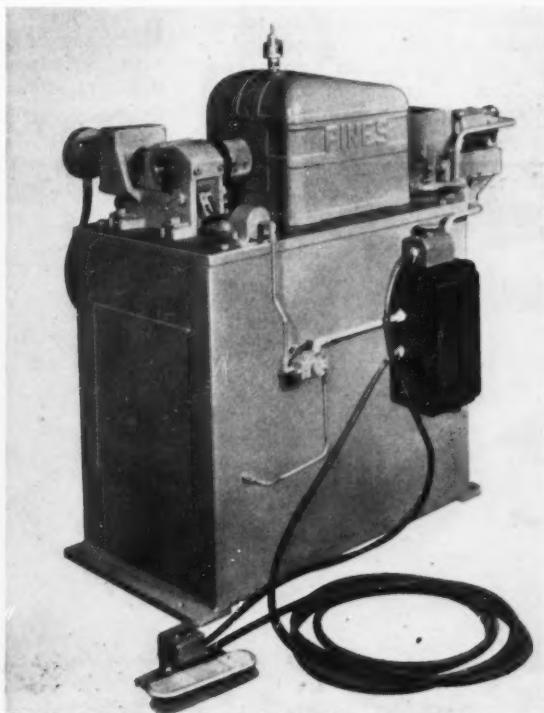
An air-operated end-finishing machine designed for deburring, chamfering, and facing operations on work up to 3 inches in diameter is being manufactured by the Pines Engineering Co., Inc., Dept. M, 601 Walnut St., Aurora, Ill. This machine has a 2-inch stroke and a maximum spindle speed of 2000 R.P.M. It can be applied for such operations as light turning with hollow-mill tools, chamfering

and pointing bar stock, shaping tube or rod ends, or center-drilling. Tools and chuck jaw inserts are interchangeable to fit work of any diameter within the maximum 3-inch range. The spindle drive motor, with variable-speed control for work diameters, is enclosed within the machine base.

The air cylinder for closing the chuck and the cylinder for advancing the spindle are controlled



Web-thinning attachment on a "Cawi-Spiral" twist drill grinder, introduced by Kurt Orban Co., Inc.



Air-operated end-finishing machine recently placed on the market by the Pines Engineering Co., Inc.

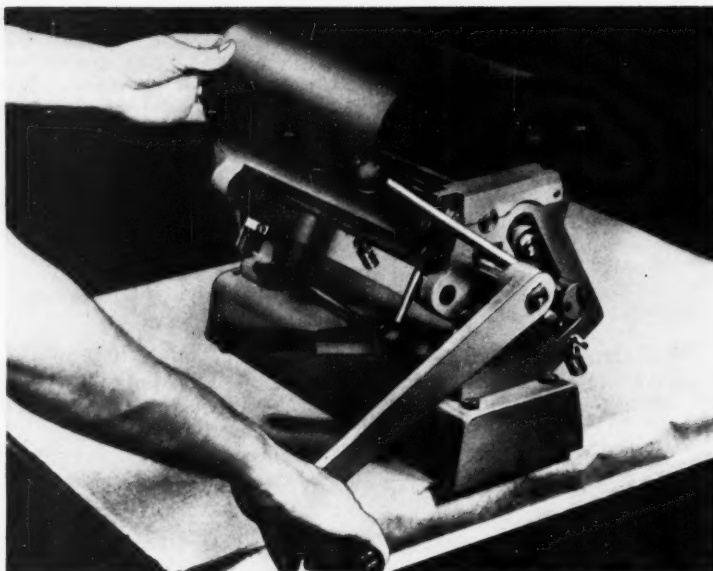
by a foot-operated electric switch. Movement of the foot-switch closes the chuck and advances the spindle through the machining cycle. An adjustable stop automatically retracts the spindle when the cut is completed. Both air cylinders operate from the same air line at a pressure of from 70 to 80 pounds per square inch. The cycle time of the unit, less cutting time, is one and one-half seconds.

The compact, floor-mounted model has a base 20 inches wide by 39 inches long, with a 6-inch chuck overhang on the width and an 18-inch overhang of the spindle unit to the rear.

### Di-Acro Hand-Operated Rollers for Cylindrical Forming of Sheet Metal

The addition of six new models of a hand-operated roller, said to increase the material capacity and forming width range over that of its previous models, has been announced by the O'Neil-Irwin Mfg. Co., Dept. M, 559 Eighth Ave., Lake City, Minn. The material capacity range of these rollers is from 16- to 24-gage sheet steel, the forming width range from 12 to 42 inches, and the radius bending capacity from 2 inches to infinity. A cam-idler feature incorporated in the design of the rollers makes it possible to form cylinders of any diameter in two passes.

Circle forming of the same diameter as the forming rolls or



Di-Acro roller set up for two-pass circle forming operation

slightly larger diameter can be done in one pass through the roller by making a small adjustment. Bends can also be located in any position along a sheet of material being formed in the roller because the material can be fed through the rolls without bending until the cam-lever is en-

gaged. As a result, rectangles and a wide variety of shapes with straight sections on both sides of the bend can be produced. Round, flat, and square stock, as well as many other shapes of ductile materials, can be formed with this precision machine. Rolls for special bending jobs can be supplied.

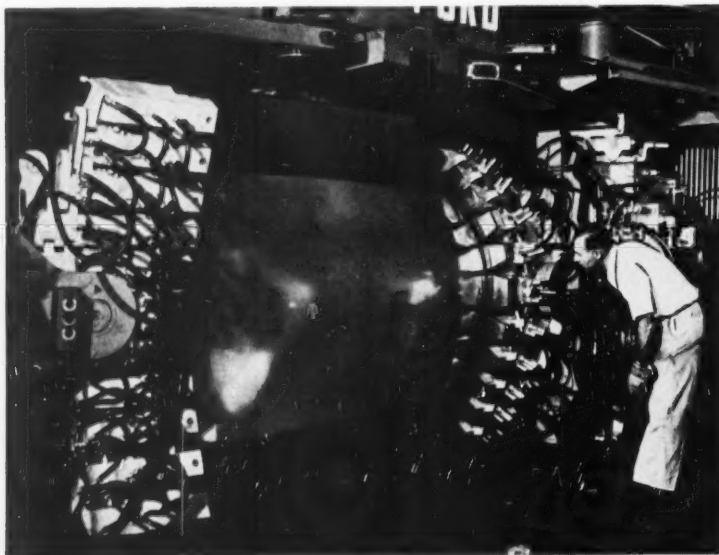
### Hydra-Curve Flexible Jaws for Stretch-Forming Machines

Flexible jaws especially designed for use on all types of sheet-metal stretch-forming equip-

ment are being made by the Hufford Machine Works, Inc., Dept. M, 1700 E. Grand Ave., El Segundo, Calif. These work-gripping devices are known as Hufford Hydra-Curve jaws. Their function is to grip and curve the sheet to conform with the cross-sectional contour of the die. While held in this manner, the stretch-forming operation completes the forming of the longitudinal curves in the part.

Use of these flexible jaws is said to save as much as 30 per cent of the material normally allowed to extend beyond the ends of the die to take care of transitional stresses in the sheet. The jaws also simplify the forming of all parts with less wrinkling and make possible the forming of exceedingly deep curves by the stretch-forming process. Since stresses are considerably lower in the sheet material when using Hydra-Curve jaws, many aluminum parts can be formed without any preparatory heat-treatment.

The jaws are composed of numerous segments, each containing



Hufford concave and convex Hydra-Curve jaws applied to stretch-wrap forming of sheet-metal part over a non-symmetrical die



a set of hydraulically actuated grippers. The segments are hinged, one to another by pivot-pins, thus permitting conformation to a wide variety of die curves—half round, S-shapes, and convex or concave forms. The degree of curvature is established by adjustable set-screws, which act as fixed stops in front of and behind each segment. Jaw curvature is energized or straightened by a pair of hydraulic cylinders in each segment which are controlled from the operator's pedestal. The jaws are always loaded in a straight-line position and curved just before or during the stretch-forming operation.

A centroid shifter is provided to centralize the load of a curved shape to the tension cylinder shaft. This is essentially a slide on which the jaw is mounted, permitted its position to be shifted laterally by a hydraulic cylinder or screw. Jaw elements consist of two removable grippers in each segment, which are serrated for holding the work and slide on opposed tapered surfaces. Although opened or closed by a hydraulic cylinder, gripping action is self-

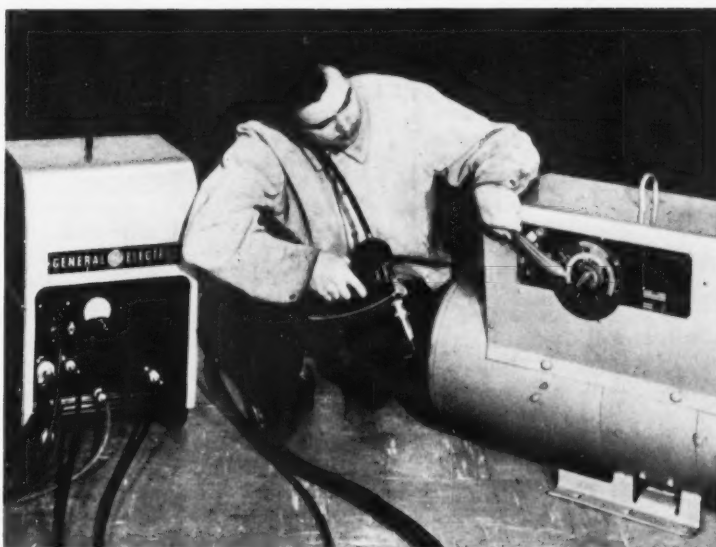


Fig. 1. General Electric "Fillerarc" welding equipment consisting of wire driving unit, welding gun, and special self-regulating welder

energized by the tapered surfaces. The jaws are designed in sizes for use on all Hufford stretch-wrap forming machines, but can also be made for other machines.

### G-E Consumable-Electrode Gas-Shielded Welder

Welding equipment recently developed for the consumable-electrode gas-shielded welding process has been announced by the General Electric Co., Dept. M, Schenectady 5, N. Y. This appa-

ratus, called the "Fillerarc," is designed to advance the field of application of high-speed, high-current density, gas-shielded welding. Electrode wire of aluminum, stainless steel, mild steel, copper,

magnesium, and various alloys may be used in the welder with argon or helium shielding gas. The process can be used in down-hand, vertical, or overhead positions to weld any aluminum alloy in thicknesses from 1/32 inch to 3 inches and stainless steel from 1/16 to 1 inch. It is also suitable for welding aluminum-bronze, nickel, and magnesium.

The "Fillerarc" equipment consists of three main components: a self-regulating motor-generator type welder, a pistol-like holder, and an electronic wire-driving unit. The welding generator is rated at 450 amperes and is self-regulating. It is designed to give constant arc length and produce any current required up to its full rating. Once the arc length is set, the operator can change the wire feed, even while welding, without readjusting the welder. The open-circuit voltage is between 10 and 30 volts.

The welding gun contains knurled feed-rolls for pulling the electrode wire from a spool mounted in the wire-driving unit, a trigger to control wire feed and gas flow, and an electrical contact tip. It is water-cooled and has a rating of 400 amperes, continuous direct current. The gun is capable of feeding wire from 0.030 to 0.093 inch in diameter. The wire-feed speed can be adjusted from 0 to 750 inches per minute by means of a remote two-speed switch. The set speed is held constant by an electronic motor con-

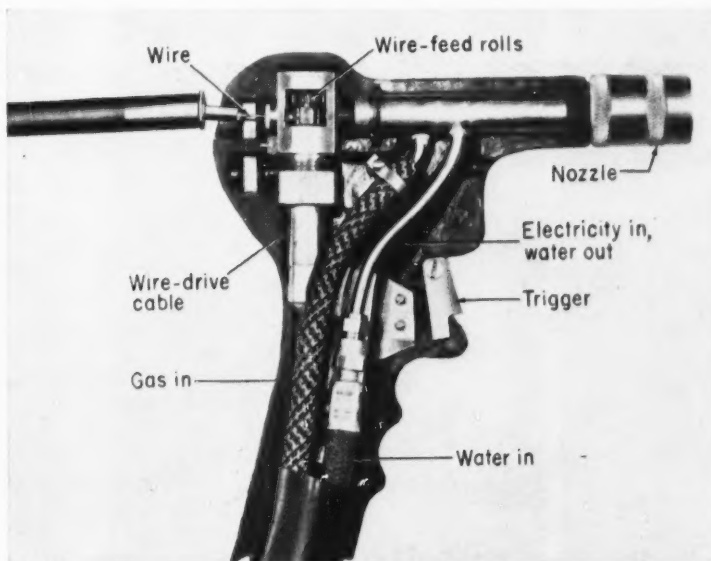


Fig. 2. G-E welding gun containing knurled feed rolls for feeding electrode wire of aluminum, steel alloys, and other metals



trol in the wire-driving unit. Finger-tip control enables the operator to obtain gas coverage automatically before and after the arc is struck.

### **"Contour-Matic" Wiping Tip Grinder**

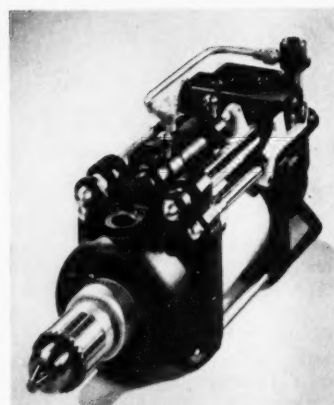
A "Contour-Matic" grinder built by Mallard Industries, Inc., Cleveland, Ohio, is being introduced by the Kodiak Corporation, Dept. M, 801 Caxton Bldg., Cleveland 15, Ohio, for grinding a wide variety of turbine bucket wiping tips. The automatic cycling mechanism of this machine insures close control over production. The tool equipment is easily installed and is interchangeable.

The duplicator mechanism can be adapted for many other contour grinding operations. The machine is equipped with a 5-H.P. 220- to 440-volt, gear head driving motor. An automatic wheel dresser and thickness control mechanism are regular equipment. A wheel 14 inches in diameter is mounted on the 1-inch spindle. The grinding cycle of the machine requires approximately six seconds, giving a production rate of up to 200 pieces per hour, depending upon the type of bucket to be ground.

### **"Holomatic" Automatic Air Drilling Unit**

A Model 14 "Holomatic" drilling unit weighing 30 pounds has been added to the line manufactured by Hause Engineering, Dept. M, Montpelier, Ohio. The unit is powered by compressed air and is hydraulically fed. It is adaptable for either automatic or manual cycle control. The stroke is adjustable up to 4 inches and there is sufficient capacity for drilling holes in steel up to 1/2 inch in diameter.

Provision is made for positive stopping followed by instantaneous retraction or by a dwell period. The unit controls can also be set for continuous cycling; skip drilling; back-feeding; and manual jogging. The rotary air motors are available in a variety of capacities up to 3/4 H.P. and speeds of 500 to 15,000 R.P.M. The drill-



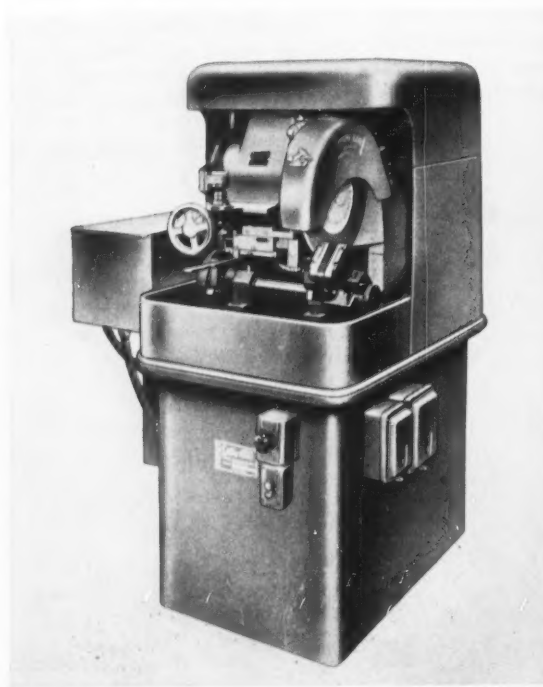
"Holomatic" drilling unit announced by Hause Engineering

ing unit can be arranged to suit a wide range of requirements, and can be mounted in horizontal, vertical, or angular planes.

### **Pneumatic and Hydraulic Fixtures for Use in Broaching Brake-Shoes**

As a means of reducing loading and unloading time to a minimum, and thereby speeding up the broaching operation on automotive brake-shoes, the Colonial Broach Co., Dept. M, Box 37,

Harper Station, Detroit 13, Mich., has equipped a standard Colonial dual-ram broaching machine of 10 tons rating and a stroke of 54 inches with special shuttle fixtures. These fixtures are pneu-



Mallard "Contour-Matic" wiping tip grinder placed on the market by Kodiak Corporation

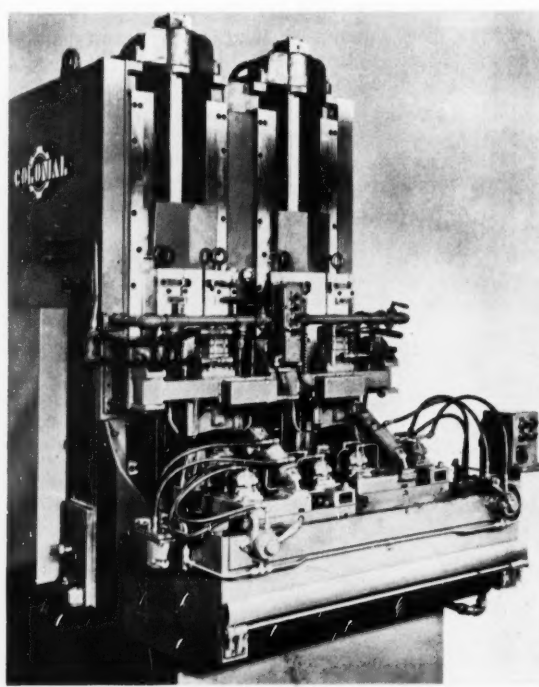


Fig. 1. Colonial dual-ram broaching machine equipped with pneumatic hydraulic shuttle



Fig. 2. Automotive brake-shoe in which concave groove and slot are broached simultaneously by machine shown in Fig. 1

matically positioned and have hydraulically operated clamps. Insert type broaches are used to cut a slot at one end of brake-shoes and a concave groove at the other at the rate of 400 per hour. One of the brake-shoes is shown in Fig. 2.

Single manual control of three pneumatic cylinders enables the brake-shoe to be positioned quickly and accurately against three stops by the movement of a control lever. This arrangement also permits quick release of the part after broaching. Hydraulic clamping is accomplished with a single cylinder that actuates a

saddle clamp and is an integral part of the automatic broaching cycle. Since there are two shuttle fixtures, one can be loaded and unloaded while the other is going through the broaching cycle. Maximum stock removal on both the 1/2-inch slot and the 13/32-inch concave groove is 13/32 inch.

#### Ultrasonic Measuring Instrument

An ultrasonic "Metroscope" that is said to represent a distinct advance in non-destructive ultrasonic measuring and testing of

metals and other materials has just been announced by the J. W. Dice Co., Dept. M, 1 Engle St., Englewood, N. J. Signal-to-noise ratio, picture clarity, and line voltage correction have been greatly improved in this Model MS-101 over the maker's original Model MS-100 instrument employed in industrial and ordnance plants for the last six years.

The instrument is particularly useful where wall thickness measurements or tests must be made from one side of the material only, as in the forming or construction of propeller blades, tanks, pressure vessels and cylinders, ship plate, pipes, bomb casings, and any formed or drawn shape. The instrument also readily finds internal defects of a laminar type in sheet materials and imperfect bonds between clad metals, switch contacts, bearing linings and cutting tool tips.

#### Burr Master Tumbling Barrel

A new line of deburring equipment has been marketed by the White-Roth Machine Corporation, Dept. M, Lorain, Ohio. This BurrMaster barrel tumbler removes welding slag, flame-cutting slag, burrs, and rust from weldments



Ultrasonic measuring instrument manufactured by the J. W. Dice Co.



BurrMaster tumbling barrel announced by the White-Roth Machine Corporation

and machined parts. Welding and flame-cutting slag can be removed very rapidly from most parts.

The unit is of welded steel construction except the barrel door which is made of aluminum for easy installation or removal. Both the barrel and barrel door have neoprene linings.

The large BurrMaster barrel is 32 inches in diameter, 48 inches long, and has a total load capacity of 2000 pounds. Over-all height of the unit is 72 inches, the length

62 inches. All moving parts are completely enclosed to insure safe operation.

The variable-speed drive can be set to rotate the barrel at any desired speed from 5 to 30 R.P.M. Push-button control facilitates positioning the barrel door for convenient unloading and draining. The self-locking drive prevents the barrel from moving during loading or unloading. An electric timer shuts off the equipment when the cycle is completed.

### Baldwin-Defiance Press

A Baldwin-Defiance Model "C" compacting press, built by the Baldwin-Lima-Hamilton Corporation, Dept. M, Philadelphia 42, Pa., will be exhibited for the first time at the Metal Exposition of the American Society for Metals, October 19 to 23, in Cleveland, Ohio. This mechanical, four-column, crank type press is equipped with a flywheel, pneu-

matic clutch, and pneumatic brake. Operation is by a variable speed-drive unit with a 20-H.P. totally enclosed motor. The press mechanism is sealed to prevent the entrance of abrasive materials, thus making it suitable for compacting powdered metal as well as pressing ceramic parts and grinding wheels.

Accurate compressing pressure is assured through the use of a

hydraulic head, the ram of which supplies opposing pressure for the upper punch. Thus, if the compressing pressure exceeds that for which the hydraulic accumulator is set, the upper punch serves to limit the pressure within the pre-set range, preventing overloading and prolonging the life of the tools and press. Provision is made for an auxiliary stationary core-rod, making it possible to have both a floating core-rod and a stationary core-rod installed in the press.

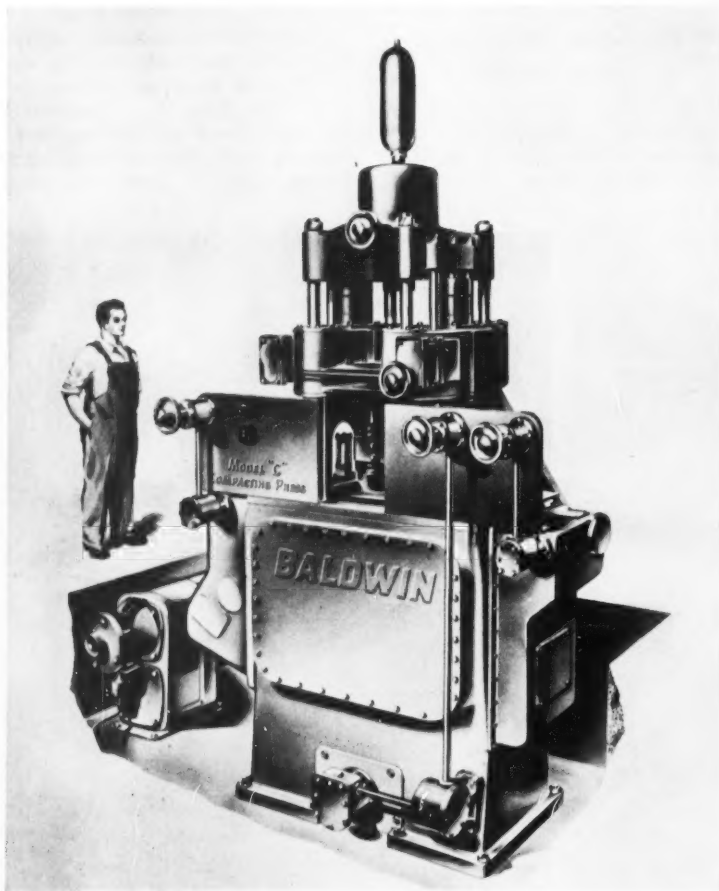
An air-operated, cam-controlled shuttle type feeder carries the material to be compacted from under a stationary hopper to a position over the die. The press has a rated pressure of 100 tons, and a maximum resistance to movement of the air-operated floating die-holder and core-rod of 5 tons, which can be increased up to 50 tons at an additional cost for equipment required for a change-over to oil pressure operation.

### Automatic Dowel-Pin Pressing and Cap-Screw Driving Machine

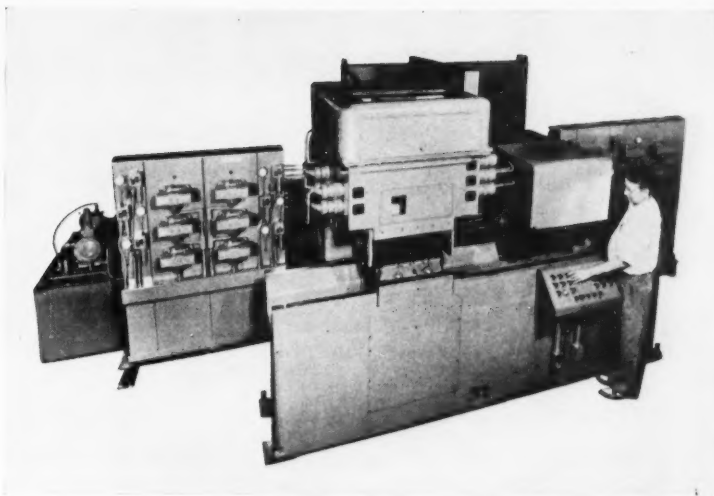
A line of automatic torque-controlled cap-screw, bolt, and nut driving machines is now available from the Hautau Engineering Co., Dept. M, 721 Wanda, Ferndale 20, Mich. These hydraulically operated multiple-spindle machines will automatically tighten a nut or bolt to a given torque specification, tighten a bolt to a specified elongation, or drive a stud to a given depth.

Each driving spindle is powered by a hydraulic fluid motor. Depending on the torque requirements, the motor is either connected directly to the torque-adjusted driving spindle or a double-enveloping cone-drive worm-gear set is provided in the drive.

When driving a bolt, stud, or nut, the hydraulic motor is run initially at low pressure and speed, thus providing a low torque drive and assuring positive engagement between the fastener and the rotating spindle sockets. When the sockets have engaged the fasteners, an increased volume of oil is directed to the fluid motors to rotate the spindles at high speed and provide a fast run-down. When the fastener is within one or two turns of the required depth, a valve is actuated by a depth control finger to direct a high-pressure, low-volume oil flow



Baldwin-Defiance press for compacting powdered metal, ceramic parts, and grinding wheels



Hautau torque-controlled cap-screw driving machine

to the hydraulic motor. Thus a high-torque, slow-speed final drive is provided.

Torque capacities of the machines range from 35 to 120,000 inch-pounds. Torque specifications can be held within a 2 per cent tolerance, and length or elongation within 0.0004 inch. The machines are fully adapted to transfer type mass production assembly lines.

The machine illustrated tightens ten main-bearing cap-screws on a V-8 automotive engine block. It has an auxiliary head that presses ten 1/4-inch dowel-pins in the bearing caps ahead of the controlled-torque nut-driving operation. The operator mounts the caps on the engine block, starts the bolts one or two turns, and drops the dowel-pins in slip-fit holes in the caps. Then he manually slides the block on the machine rails over transfer dogs and presses the cycle start button.

At any given time there are three blocks in the machine: one having the dowels pressed into place, another waiting for the torque-controlled driving operation, and a third on which the driving operation is being performed. The cycle time for the complete operation is twenty-four seconds.

### Oil Compound for Slotting Saws

Elimination of the need for side clearance on slotting saws and an increase in the efficiency of high-speed slotting operations are ad-

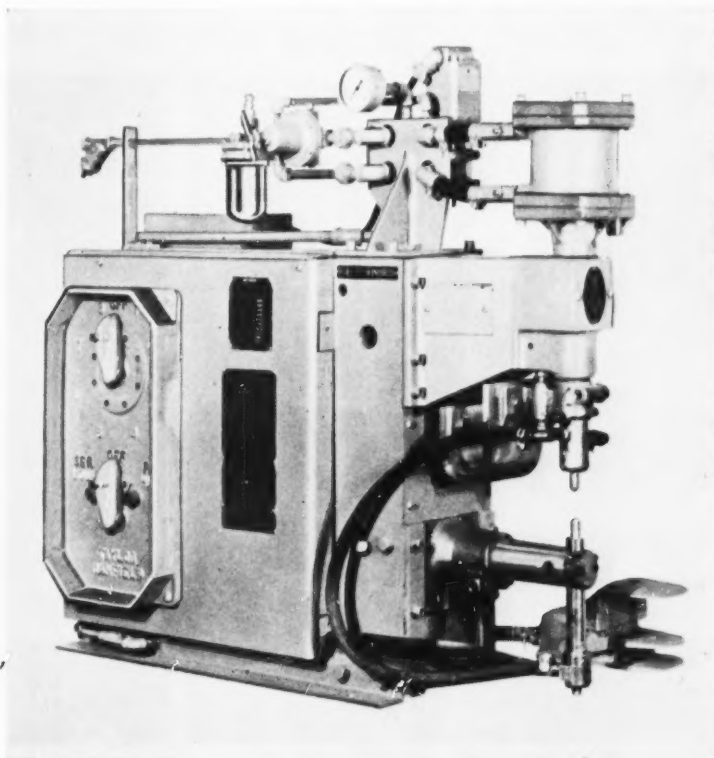
vantages claimed for a new oil compound brought out by the Van Straaten Chemical Co., Dept. M, 546 W. Washington Blvd., Chicago 6, Ill. This compound has rapid penetration and a very fast washing action. It is said to work well under conditions of extremely high pressures. It is called "Vantrol 5468A."

### Air-Operated Spot-Welder

The Taylor-Winfield Corporation, Dept. M, Warren, Ohio, has introduced a Type EB-3 air-operated spot-welder which provides a welding force of either 750 pounds or 1000 pounds maximum when the welder is connected to an air line having a pressure of 80 pounds per square inch. The throat depth is 8 inches, and the electrode has a maximum stroke of 1 3/4 inches. The lower horn of the welder is 2 inches in diameter and has a vertical adjustment of 4 inches. It also has an additional vertical adjustment of 1 1/4 inches when the lower horn holder is inverted. The lower electrode holder is of the ejector type. It is 6 inches long and 1 inch in diameter, and has a No. 1 Morse taper.

The upper electrode holder, also of the ejector type, is built as a permanent part of the upper terminal and takes a No. 1 Morse taper electrode. Upper and lower electrodes are of Code B-216, domed type, Class 2 alloy with a No. 1 Morse taper. The over-all length is 1 1/2 inches.

Although many possible combinations of electrical controls are available, the use of synchro-



Taylor-Winfield air-operated spot welder



nous precision controls is recommended when the work requirements are exacting. A magnetic or electronic contactor and a sequence-weld timer are necessary equipment.

### Optical Cam Contour Checking Fixture

Optical Gaging Products, Inc., Dept. M., 26 Forbes St., Rochester 11, N. Y., has developed equipment for the optical gaging of cam contours. Using light from the surface illuminator of a Kodak contour projector, this optical gaging method permits rapid inspection of cams mounted the same as in their final assembly.

Basically, the method is simple. The cam is mounted on an arbor which can be turned by hand. Turning the cam actuates a follower which carries with it an indicator ball. How closely the indicator ball follows tolerance lines, also rotating with the cam, may be readily observed on the projector screen.

The cam to be checked is mounted on an arbor of the staging fixture shown in Fig. 1. In Fig. 2 are seen the tolerance and cam contour lines and the indicator ball shadow on the screen of the contour projector.



(Left) DoAll micrometer checking set (Right) Checking spindle and anvil of micrometer with optical parallel under a Monolight

### DoAll Linear and Optical Standards for Checking Micrometer Accuracy

A micrometer checking set designed for checking 1- and 2-inch micrometers has been added to the line of gages made by the DoAll Co., Dept. M, 254 N. Laurel Ave., Des Plaines, Ill. The set includes three gage-blocks in the 0.2500-, 0.6500-, and 1.000 inch sizes, respectively. These are used individually or in combination for checking the accuracy of the micrometer

screw at various points in its travel.

Two optical parallels of fused quartz, also part of the set which is shown at the left in the illustration, provide an accurate and simple method for checking the condition of the micrometer spindle and anvil faces. In making such checks, a parallel is held between the gaging surfaces of the microm-

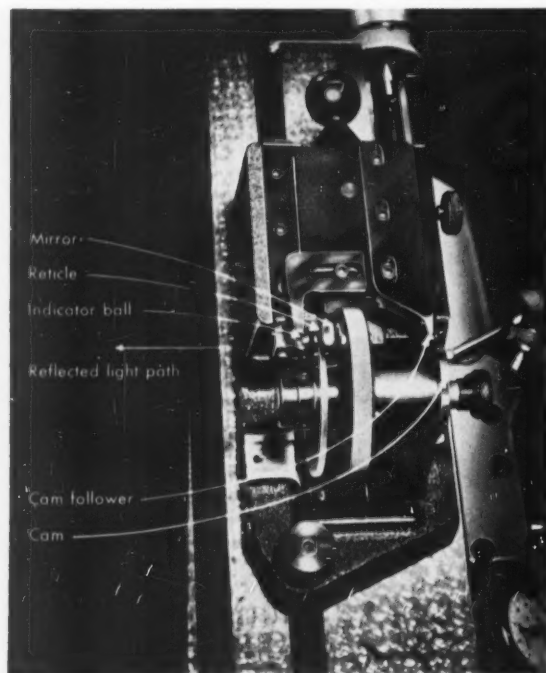


Fig. 1. Staging fixture which was developed by Optical Gaging Products, Inc., for checking cam contours

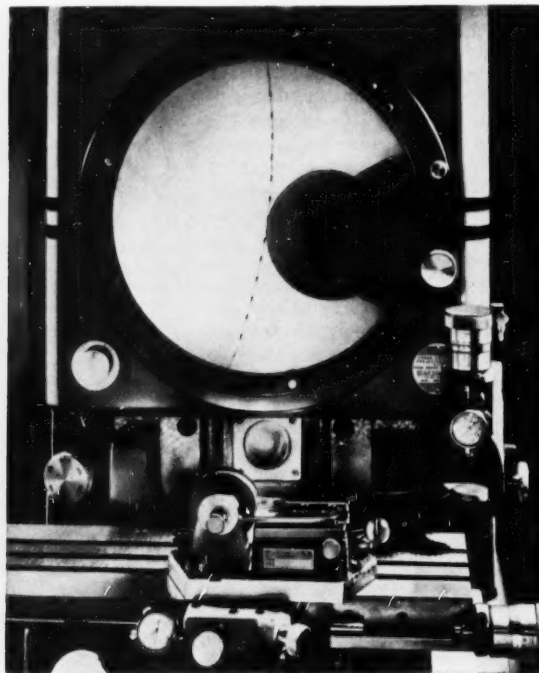
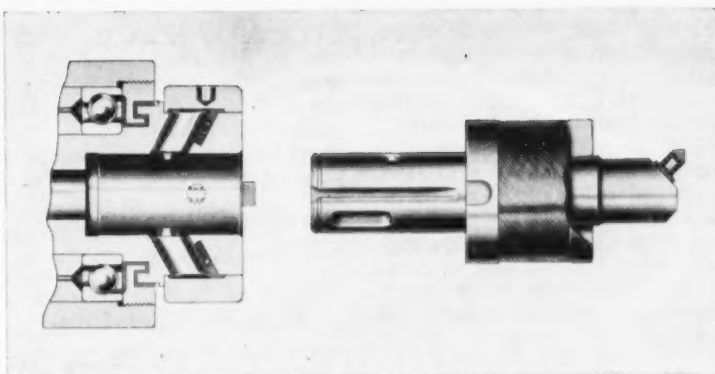


Fig. 2. View of contour projector screen showing magnified images that indicate accuracy of cam contour

eter anvils. Then under a monochromatic light, such as the DoAll Monolight seen in the right-hand view, the fringe lines appearing on the micrometer gaging surfaces may be read to determine deviation from flatness, parallelism, or squareness of the spindle faces to the spindle axis. The optical parallels are of two different sizes—one 0.500-inch thick and the other 0.5125-inch. These sizes permit optical checks to be made of the spindle at two points in its rotation 180 degrees apart.



### Quick-Change Spindle for Fosdick Jig Borers

The Fosdick Machine Tool Co., Dept. M, Cincinnati 23, Ohio, has announced a quick-change, high-precision spindle for its jig borers and automatic positioning machines. This "B F Spindle" has a precision Beaver type tool-holder built integrally with the spindle. With this equipment, tools can be changed in less than ten seconds with such accuracy that hole sizes can be duplicated within plus or minus 0.0001 inch without resetting the boring tools.

Straight shank adapters are used to hold tools which are not

Fosdick quick-change precision "B F Spindle" and Beaver type tool-holder

already provided with Beaver shanks. The tool is locked in the spindle by two cam-ring-actuated plungers that draw the flanged adapter shank firmly against the ground nose of the spindle. A spanner wrench is used to rotate the cam-ring a fraction of a revolution to lock or unlock the tool. After unlocking, the tool does not drop out until the cam is rotated to the end of its travel, eliminating damage to the tools through accidental dropping.

The spindle is available as extra equipment on all Fosdick jig

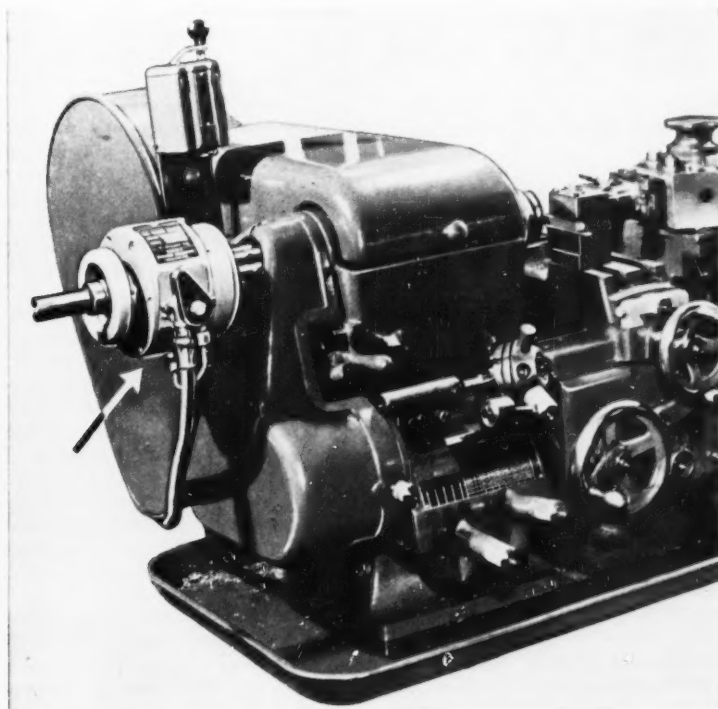
borers and automatic positioning machines. It can also be adapted to machines in the field. Adapters are available that accommodate Nos. 1, 2, 3, and 4 Morse tapers, 5, 7, 9, and 10 Brown & Sharpe tapers, No. 40 N.M.T.B.A. taper, and straight bores from 1/4 to 1/2 inch and 1/2 inch to 1 1/4 inches.

### Wilson Air-Operated Collet Closer

A new Wilson air-operated collet closer for engine and turret lathes with capacities for handling bar stock up to 1 inch in diameter is being distributed by Durable Products, Dept. M, 816 W. 50th St., Minneapolis 19, Minn. The operating principle of this device is based on the use of a stationary, neoprene tube that is inflated by air to operate the collet-closing mechanism. The need for rings, pistons, and packings with their attendant air-leakage problems is thus eliminated. Finger-tip or foot control of the collet closer is provided. Accuracy, elimination of work slippage and damage to delicate parts, and automatic adjustment for variations in the size of stock or machined parts are other advantages.

### Airco Mild Steel Electrode

The Air Reduction Sales Co., Dept. M, 60 E. 42nd St., New York 17, N. Y., has announced an improved E6010 electrode—the Airco 78E—which has been developed for welding mild steel in all positions. This electrode is said to give deep penetration without undercutting, reduce spatter to a minimum, and produce smooth



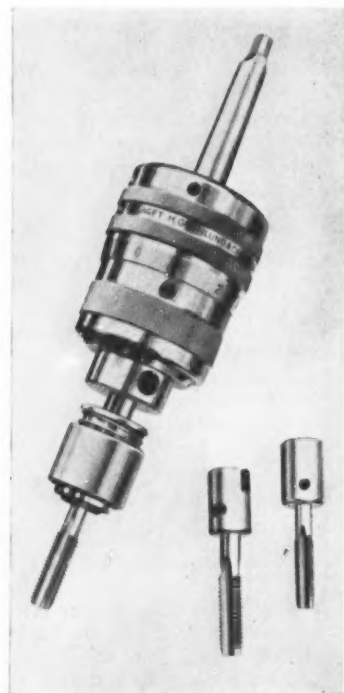
Lathe with finger-tip or foot-controlled air-operated collet closer distributed by Durable Products

uniform weld deposits. Quick solidification of the weld deposit makes this electrode especially well adapted for welding in the vertical and overhead positions.

The electrode is recommended for the fabrication of mild steel plate and rolled sections or castings; and for welding fired and unfired pressure vessels, structural frames, pipe lines, and all classes of marine work where high ductility and tensile strength are essential.

### Tapping Attachment with Quick-Change Chuck

Homestrand, Inc., Dept. M, Larchmont, N. Y., has introduced a tapping attachment known as the GNG, which is designed to reduce tap breakage and cut production costs. A feature of this attachment is the provision for accurate control of the driving torque transmitted through a sensitive disc clutch. By simply turning a graduated sleeve, the operator can instantly set the attachment for the required torque. This is an important advantage when consecutive tapping of various size holes is necessary. A quick-change chuck can be used to obtain a further saving in time.

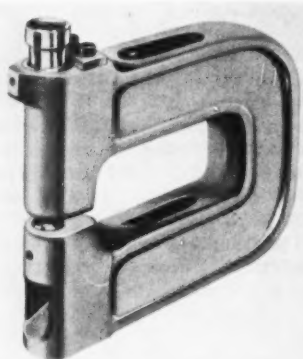


GNG tapping attachment introduced by Homestrand, Inc.

In actual operation, the tap rotates at the same speed as the spindle. When the tap is retracted, however, it reverses itself and rotates at double the tapping speed. The attachment is regularly supplied with a No. 2 Morse taper. Taps are available in sizes from 5/32 through 9/16 inch.

### Line of Self-Contained Hole-Punching Units

A line of hole-piercing and notching units is being manufactured by Toolset, Division of General Riveters, Inc., Dept. M, 777 Hertel Ave., Buffalo 7, N. Y. These self-contained units can be mounted on the lower bed of a press in place of customary die

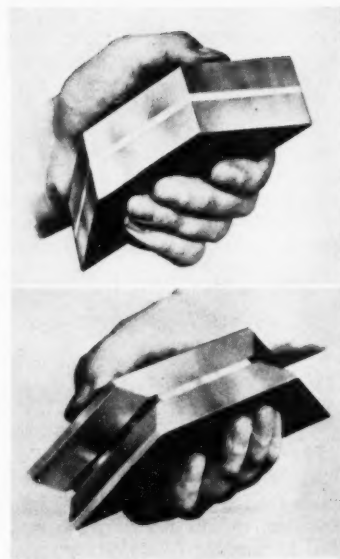


Hole-punching unit made by Toolset, Division of General Riveters, Inc.

sets. A free-floating punch and a guide transmit the load of stripping directly on the work instead of on the upper arm of the holder. The punch and die are permanently and automatically aligned in the holder.

Toolsets can be set up in any desired pattern by bolting the holder in position on a mounting template or a T-slotted plate. The units can be re-used in any number of set-ups and each holder accommodates a number of punch sizes which can be interchanged to suit the job.

Stock sizes in holders are available in the following widths: 1 inch, 1 1/4, 1 1/2, 2 1/4, 2 3/4, and 3 1/2 inches with from 4- to 16-inch throat depths. Each holder will accommodate punches for round, square, rectangular, or irregular shapes. The units can be easily assembled without special tools.



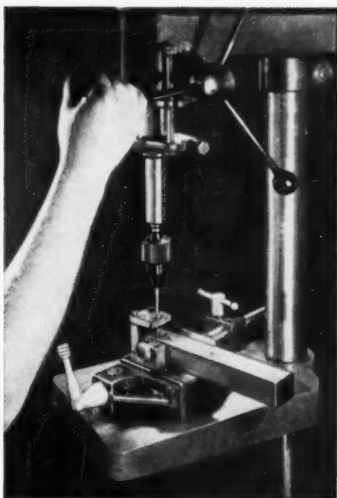
Aronson magnetic welding clamps

### Magnetic Welding Clamps

The Aronson Machine Co., Dept. M, Arcade, N. Y., has developed a line of magnetic welding clamps said to have many uses, particularly in the welding field. They can be used to locate and hold pieces of metal together for tacking and welding. For example, they can be used to hold two flats together for butt-welding, or one piece 90 degrees to another for fillet-welding.

There are five models in the line. The MCP, or plain, clamp has a 45-degree surface at either end, as shown in the upper view of the illustration. This clamp is used to hold flats to flats. The Model MCV clamp, shown in the lower view, has a vee at each end but has a plain top and bottom. This model is used to hold rounds to rounds, rounds to flats, or flats to flats. The MCA model is adjustable to any angle. It consists of one set with two magnets attached with a link on either side held with a thumb-screw. These will hold light sheet metal at any angle.

The other two models are used for holding and lifting heavy plate—Model MCR 4-inch pot magnet and Model MCQ 3 3/4-inch cube magnet, having capacities of 275 and 375 pounds, respectively, with an air gap of 0.005 inch. The cube magnet has facilities for attaching any number together for additional weight capacity. They both have a hand thrust screw for lifting the clamp from the work.



Quick-change vise introduced by the AMF Float-Lock sales department

### Quick-Change Vise for Drill Press

A quick-change safety vise designed to save time on production drilling jobs has been placed on the market by the Wahlstrom Float-Lock sales department of the American Machine & Foundry Co., Dept. M, 5502 Second Ave., Brooklyn 20, N. Y. This vise has a quick-adjusting ratchet jaw and is provided with three bosses to facilitate the attachment of jigs. Any number of holes can be drilled without removing the work since the vise can be turned over on three sides for maximum drilling flexibility.

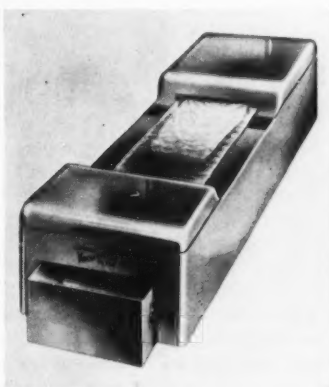
The vise can be locked securely by a quarter-turn of the T-handle, at any position on the table, thus making it a dependable drill jig when duplicate pieces are required. The work is locked or released by a mere flick of the hinged handle which operates the screw jaw. The vise is available with either a 9- or 12-inch jaw opening and serves as an excellent holding device for end drilling and centering, angle drilling, centering long rounds, and drilling sheet metal.

### Adamas Grade 434 Carbide for Rough-Turning Steel

The Adamas Carbide Corporation, Dept. M, 1000 S. Fourth St., Harrison, N. J., has recently developed a Grade 434 carbide. This grade was originally developed for

rough-turning operations on shells but has proved to be suited for rough-turning all types of steel and armor plate. It has also been used on centrifugally cast 309B stainless steel with unusual results.

Feeds ranging from 0.015 to 0.068 inch per revolution, and speeds from 68 to 600 surface feet per minute, have been used in testing tools made from grade 434 carbide. Depths of cut from 1/8 inch to 1 1/4 inches were used. Although this grade carbide has proved excellent for heavy roughing and interrupted cuts, it should not be employed for light-finishing operations.



Vacu-matic coolant filter made by Industrial Filtration Division, U. S. Hoffman Machinery Corporation

### Hoffman Vacu-matic Filter

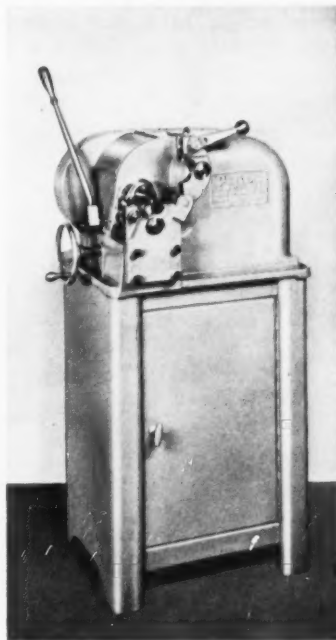
Automatic, continuous filtration of water-soluble coolants for individual grinding, honing, and other types of machine tool operations is provided by a constant-vacuum, endless-belt filter developed by the Industrial Filtration Division of U. S. Hoffman Machinery Corporation, Dept. M, 219 Lamson St., Syracuse 6, N. Y. This Vacu-matic self-cleaning filter keeps the coolant cooled and delivers dewatered sludge into a tote box for disposal. The vacuum system used in this equipment is said to have a filtering speed four times faster than that obtained with the endless-belt gravity filtering system previously employed.

Two models of the Vacu-matic are available: one for flow rates of 20 gallons per minute, and the other for 40 gallons per minute. Both are compact and designed for quick, easy attachment to machine tools in the space usually occupied by sump tanks.

### Power-Operated Tube Flaring Machine for Triple-lok Fittings

The Parker Appliance Co., Dept. M, 17325 Euclid Ave., Cleveland 12, Ohio, is now manufacturing a power-operated tube flarer designated Model 232A. This high-volume machine was designed to meet the requirements of concerns manufacturing instrument panels, tools, and machines, as well as others whose products or plant operations involve extensive use of tubing for handling fluids. It is said to produce concentric, smooth, 37-degree tube flares for use with standard Triple-lok and AN tube fittings. The flares produced with this power-operated machine meet the AN, J.I.C., S A E, and A.S.M.E. standards.

The machine will flare annealed seamless copper, aluminum, steel, and stainless-steel tubing in the full range of standard tube wall thicknesses and all tube sizes from 1/8 inch through 2 inches, outside diameter. Interchangeable heads and accessory attachments can be used for square-burring tubes in this size range. Power is supplied by a 110-volt alternating-current 1/3-H.P. motor. A variable-speed pulley arrangement permits speed adjustments to suit the material and wall thickness of the tube being flared.



Tube flaring machine brought out by the Parker Appliance Co.





Attached-blade milling cutter manufactured by Millet, Inc.

### Attached-Blade Milling Cutter

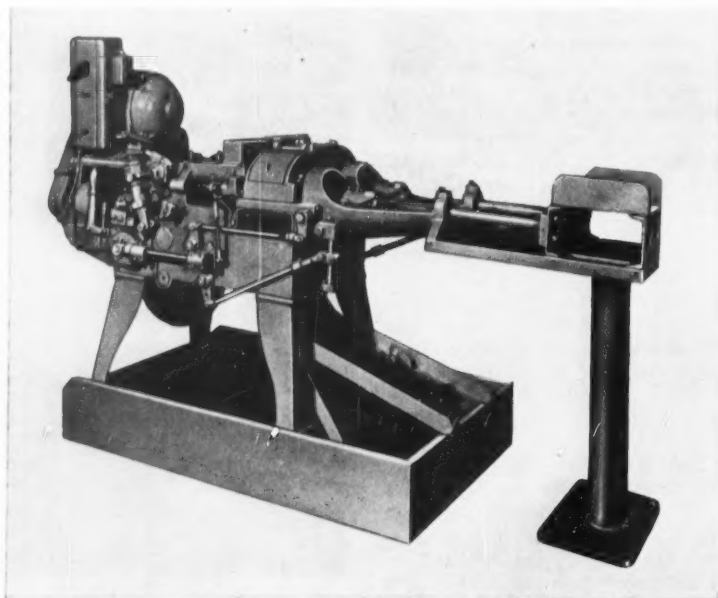
A milling cutter designed to combine the advantages of the solid-body and inserted-tooth type cutters by providing a replaceable blade with maximum tooth rigidity, has been brought out by Millit, Inc., Dept. M, 55 Flint St., Rochester 8, N. Y. Rigidity is obtained by seating the replaceable blade on the periphery of the cutter body against a body abutment that takes all cutting forces. The blades are accurately doweled in place at two points. The shank of the cap-screw serves as a dowel in a

reamed hole to locate the blade and combines with a conical seat to accurately force the blade back against the body abutment. A dowel through the abutment holds a slot in the tail of the blade and accurately locates the tail laterally.

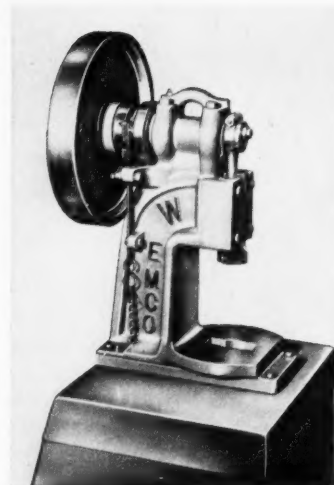
An important advantage of the design is that rake and shear angles are built into the blade instead of into the body slot. As a result, the cutter bodies can be rebladed for all types of service. A change from staggered-tooth construction to side-mill construction is accomplished by a quick change of blades. Blades are available with carbide, high-speed steel, or cast-alloy tips, each with proper rake angles built into the replaceable blades.

### Budd-Ranney Nut Blank Machine

An improved Budd-Ranney machine designed to make nut blanks in sizes from 1/4 inch to 2 inches is now being made by the Miller Glass Engineering Co., Dept. M, 148 S. Glenwood Ave., Columbus 8, Ohio. The bar stock and drills rotate simultaneously in opposite directions, thus speeding the machining operation. Revolving both the stock and the drill also tends to keep the tap-drill hole concentric with the body of the nut. The machine is made with twin spindles in models producing nut blanks up to the 1 1/2-inch size.



Budd-Ranney nut blank machine built by Miller Glass Engineering Co.



Improved Emco punch press built by the Klaas Machine & Mfg. Co.

### Emco Improved Punch Presses

The Emco line of bench type power punch presses built by the Klaas Machine & Mfg. Co., Dept. M, 4314 E. 49th St., Cleveland 9, Ohio, has been redesigned to afford increased die space by eliminating the radius in the column. A new clamping device, consisting of a tool steel block and bolt, has been provided in the ram to afford a more rigid grip and eliminate set-screws. These presses, in either bench or stand types, with or without motor drive, are available in two sizes with 3/4- and 1 1/4-inch standard strokes and 1 1/2- and 2-inch strokes.

### Rubber-Cushioned Abrasives

A series of rubber-cushioned abrasives has been announced by the Brightboy Industrial Division, Weldon Roberts Rubber Co., Dept. M, Sixth Ave. and North 13th St., Newark 7, N. J. It is available in three grades: 54BL, coarse; 70BL, medium, and 120BL, fine. All Brightboy textures are made in a variety of sizes in wheels, discs, sticks, rods, cylinders, tablets, and blocks for machine and manual use.

This Brightboy BL series has a new rubber binder, carefully compounded with abrasive grain, to achieve a tough rubber cushion for the evenly blended abrasive. These abrasives are said to be especially useful in burring, finishing, and polishing operations. The new



Brightboy series of rubber-cushioned abrasive products

textures have also been successful in removing heavy tool marks from forged aluminum, smoothing weld marks, polishing and burring stainless steel, and in many operations on both hard and soft metals. They can also be used to advantage on glass, wood, plastics, and laminated materials.

### Vernier Calipers Made in Mammoth and Midget Sizes

Vernier calipers ranging from the midget 4-inch size up to the mammoth 15-foot model shown in the illustration are being introduced by the Alina Corporation, Dept. M, 401 Broadway, New York 13, N. Y. The 15-foot calipers are

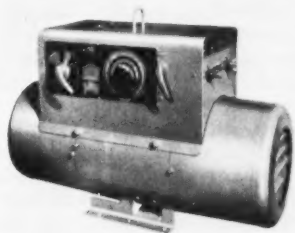


Alina midget and mammoth size vernier calipers

made to meet the requirements for precision measuring and checking of large jigs, fixtures, machine tools, and dies, as well as for use in manufacturing generators, turbines, tanks and airplane sections.

### Improved Direct-Current Generator Welders

The Metal & Thermit Corporation, Dept. M, 100 E. 42nd St., New York 17, N. Y., has redesigned its 200-, 300-, and 400-ampere direct-current generator welders. Several new features are incorporated, such as a one-dial control that provides for close adjustment of the welding current



Direct-current generator welder made by Metal & Thermit Corporation

by means of an electrode size selector and a dial for making minor current adjustments.

The current is controlled by setting the electrode selector to correspond with the size of electrode to be used and then turning the calibrated current dial to select the heat desired. A reversing switch provides means for changing the polarity.

The motor starter consists of a magnetic across-the-line contactor operated by a push-button on the control box. Two automatic reset thermal overload relays are incorporated in this equipment for protection against continuous overloads and low-line voltage.

### Accessory Set for Webber Standard Gage-Blocks

Accessories for gage-blocks have been brought out by the Webber Gage Co., Dept. M, 12900 Triskett Road, Cleveland, Ohio, to permit its standard gage-blocks to be used as gaging instruments as well as standards of measurement. Webber gage-blocks can thus be combined with the accessories in



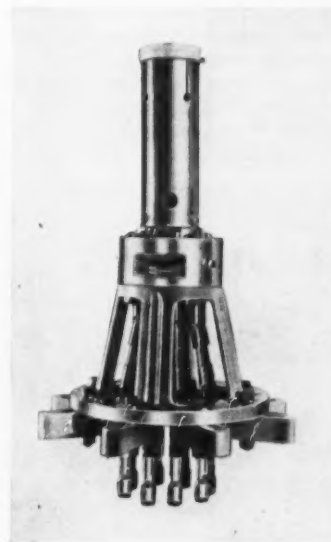
Webber standard gage-blocks with a set of accessories

built-up units to serve as snap gages, ring gages, height gages, calipers, and scribers for any dimension under 12 inches.

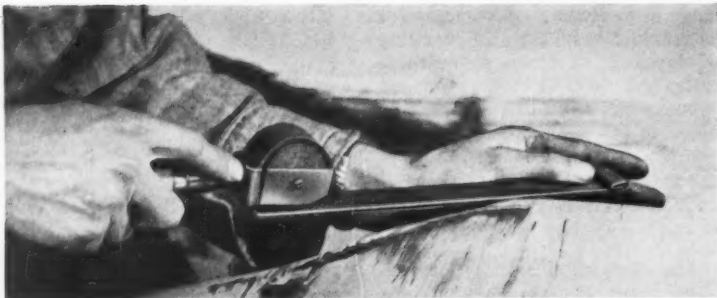
Set No. 11 consists of four gage-block clamps having capacities of 12, 6 1/2, 4, and 1 1/2 inches, respectively, a pair of 0.250-inch straight jaws, a pair of 0.250-inch half-round jaws, center point, scriber, and base block. These are combined with the blocks into a variety of precision gages for lay-out and inspection work.

### Multiple-Spindle Automatic Reverse Tapping Head

The Errington Mechanical Laboratory, Inc., Dept. M, Staten Island 4, N. Y., has brought out a



Errington multiple-spindle tapping head



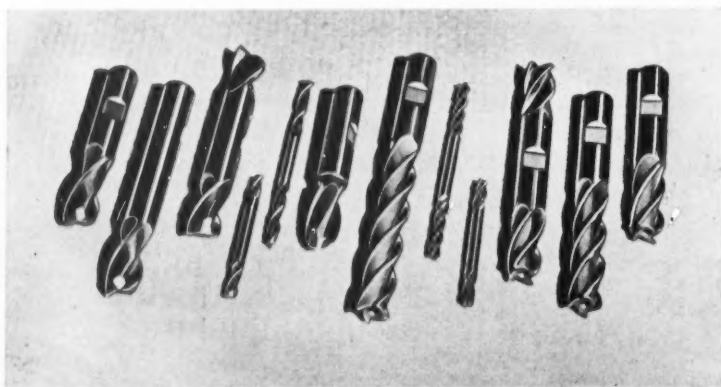
"Red-Flash" file with abrasive cloth roll

joint type adjustable automatic tapping head which has reversing mechanism built into it.

This tapping head is only about 1 inch longer than the regular Errington universal joint multiple-spindle drilling head. The tapping heads are designed to tap two, three, or four holes from 0 to 1/4 inch in any pattern from 11/16-inch centers to within a circle having a diameter of 5 1/4 inches.

### Additions to Goddard & Goddard Line of End-Mills

The Goddard & Goddard Co., Dept. M, Box 68, Brightmoor Station, Detroit 23, Mich., has just added seven styles of end-mills to their standard line. These include long, extra long, and small-diameter sizes. A total of 149 end-mills are now available in diameters from 1/16 inch to 2 inches, providing a complete range of sizes as established by the Metal Cutting Tool Institute. Also, three styles of heavy-duty end-mills are now stocked. Their design is based on the "Hi-Lix" principle of high helix and curved under-cut on the tooth face.



End-mills added to line manufactured by the Goddard & Goddard Co.

### "Red-Flash" Abrasive File

A file-like tool with a cutting surface of coated abrasive cloth has been jointly announced by the Monarch Machine Shop, Inc., Madison, Wis., and the Minnesota Mining & Mfg. Co., Dept. M, 900 Fauquier St., St. Paul 6, Minn. This abrasive file, called the "Red Flash," is designed for deburring and other finishing operations in the metal-working field. It is adapted for use in machine, tool, and die shops, as well as in sheet-metal automobile body and patternmaking shops.

The file has an 11-inch stroke section and holds a roll of more than 6 feet of abrasive cloth, providing a long cutting surface that is dispensed as needed to provide a fresh surface. The file comes in 1- and 1 1/2-inch widths.

### Hydraulic Valve with Ball Detents

A four-way hydraulic valve with ball detents to hold the valve piston in any given position is being offered by Rivett Lathe & Grinder, Inc., Dept. M, Brighton

35, Boston, Mass. The locking action of the detent permits the valve to be mounted vertically as well as horizontally and prevents movement of the valve piston as the result of vibration.

The valve is available with one, two, or three ball detents: with one detent the valve piston is held in the center position; with two detents it is held in either end position; and with three detents it is held in both the end and cen-

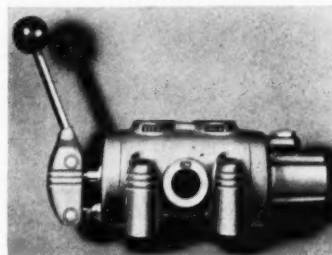


Fig. 1. Rivett hydraulic valve with ball detent

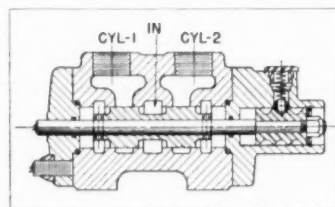


Fig. 2. Cross-sectional view of valve shown in Fig. 1

ter positions. This valve is designed for a pressure of 1500 pounds per square inch, and is available for three different types of operation—threaded stem, lever, and knob. It is made in seven sizes ranging from 1/4 inch to 1 1/2 inches, and in five piston designs to meet the requirements of any hydraulic circuit.

### Panelmount Capacitrol for Straight-Line Control

Precise straight-line control of many variables in processing systems is said to be possible through the use of a Panelmount Capacitrol unit designated Model 252P, which was recently added to the control equipment made by the Wheelco Instruments Division, Barber-Colman Co., Dept. M, Rockford, Ill. Straight-line control

of temperatures, voltage, speed, and other variables is accomplished by the simple resistor circuit of the built-in Capaciline, which anticipates changes and prevents overrunning and under-running of the control points.

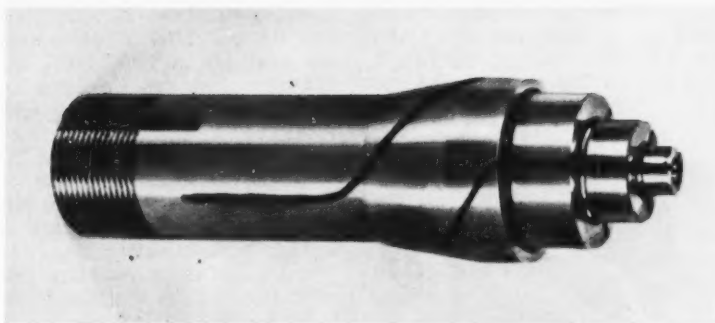
Other types of controls are available for industrial processes, including on-off, proportioning, and multi-point control systems. The Panelmount Capacitrols can be easily mounted in multiple unit instrument panels because of the uniform size of their front panels, which are all 6 3/4 inches high by 19 1/16 inches wide.



"Auto-tap" lead-screw for precision tapping made by Automatic Methods, Inc.

### "Auto-Tap" Lead-Screw Tapping Attachment

Automatic Methods, Inc., 965 W. Grand St., Division 165, Elizabeth, N. J., has brought out a lead-screw that is designed to increase the range of "Auto-tap" lead-screw tapping attachments from 5/16 to 5/8 inch. This lead-screw is intended primarily for use with the manufacturer's 500 Series "Auto-tap" support arm, and has a variety of applications. The larger lead-screws for driving taps have a diameter of 1 inch and are furnished for tapping a variety of threads, including those having



Westberg "Colletmandrel" designed for internal gripping of work handled on screw machines

27 and 18 threads per inch for 1/8- and 1/4-inch pipe taps.

A Jacobs Rubberflex collet or holding chuck furnished with the lead-screw will take tap shanks up to the 5/8-inch size. The threads of the lead-screws are ground, and a split nut permits adjustment for wear. With the lead-screw having the same number of threads per inch as the tap being used, the tap is guided and driven by the lead-screw.

### "Colletmandrel" for Gripping Bore or Inner Surface of Work

A "Colletmandrel"—which is in effect the reverse of a conventional collet—has been placed on the market by the E. Westberg Corporation, Dept. M, 800 Beley Ave., Syracuse 11, N. Y. It consists of a one-piece mandrel which grips and releases the inside surface of a piece. The tool is made to fit all machines that are designed for the use of collets, and has the same standard numbering system.

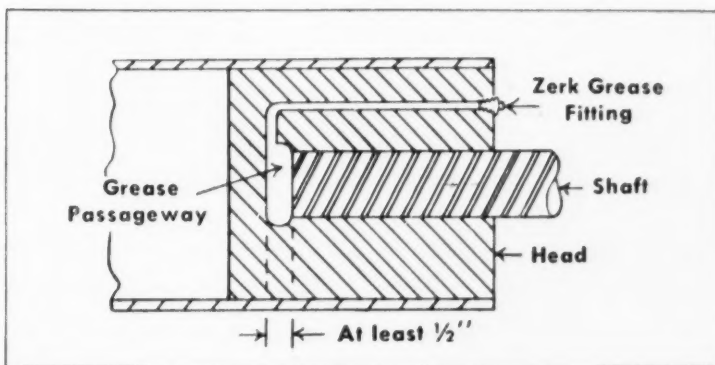
The "Colletmandrel" has one or more gripping shoulders, each

size having a range of more than 1/32 inch. Parts are made of oil-hardened alloy steel and threads are hardened and ground. Sets are available covering a wide range of work-holding sizes.

### Brass Rolls with Easily Replaced Shafts

"Renu-Shaft" rolls are being made by the Rodney Hunt Machine Co., Dept. M, Orange, Mass., which eliminate the necessity for discarding good brass rolls because of the difficulty of replacing worn or broken shafts. These rolls have a press-fitted shaft in the roll head. At the base of the shaft is a well which is connected to the face of the head by a right-angle channel sealed with a Zerk grease-fitting. With the fitting open, and the shaft hole filled with grease, the shaft is driven in to within 1/2 inch of the full depth. The Zerk fitting is then closed.

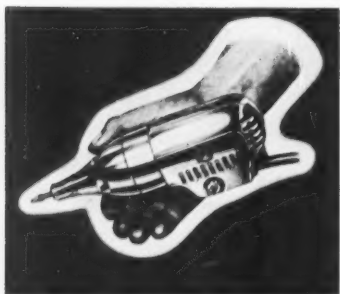
If it becomes necessary to replace the shaft, a hand grease gun or similar equipment capable of exerting a pressure of 10,000 pounds per square inch is applied



Cross-sectional view of "Renu-Shaft" roll featuring removable shaft



to the fitting. A pressure of several tons is developed which acts on the back end of the shaft, quickly forcing it from the roll body.



Electric hand tool brought out by the Precise Products Co.

### Portable Electric Grinder-Miller Hand Tool

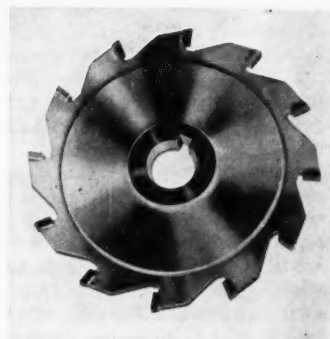
An electric hand tool designed to provide sufficient speed and power to operate tungsten-carbide "Midget Mills" and other rotary grinding, milling, finishing, and polishing tools with shanks from 3/32 to 3/16 inch in diameter has been brought out by the Precise

Products Co., Dept. M, 1338 Clark St., Racine, Wis. Wheel arbors are available in 1/8-, 3/16-, and 1/4-inch sizes for precision internal grinding and milling with rotary tools.

This Super 30 hand tool lies flat when not in use. All mounting surfaces are machined to insure accurate concentric mounting on lathes, milling machines, drill presses, and other machine tools. Specially designed mounts and other accessories are available to extend the range of applications and set-ups. The 1/5-H.P. universal motor drives the one-piece dynamically and statically balanced spindle at a speed of 45,000 R.P.M. The speed can be reduced in stages to 15,000 R.P.M. by means of a speed control.

### Nelco Slitting Saws with Reinforced Bodies

The Nelco Tool Co., Dept. M, Manchester, Conn., has brought out a line of slitting saws with heavily reinforced bodies designed to end shearing from high stresses and to prevent shattering at high operating speeds. The extremely tough and strong alloy steel bodies of these slitting saws are built



Slitting saw with reinforced body brought out by the Nelco Tool Co.

out to the same width as the teeth to minimize vibration, assure true running, and provide finer finishes to closer tolerances.

The overhanging carbide tips of these saws eliminate the necessity for grinding both steel and carbide when resharpener. Free chip removal is afforded by full side chip clearance to assure cool operation and finishes that are free from scoring. These slitting saws are available in a wide range of styles for milling practically all machinable materials.

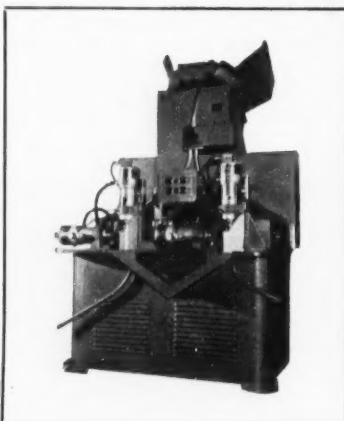
### Sander-Polisher with Two Counterbalanced Heads

Sanding and polishing tool available in either electric- or air-operated models weighing approximately 8 pounds, announced by the Cyclo Mfg. Co., Dept. M, 2140 S. Delaware St., Denver, Colo. The two counterbalanced heads of this tool are said to eliminate all centrifugal force effect and to give hand-finish results without swirl marks, scuffing, or burning. It is adapted for sanding and polishing metals, enamels, and other surfaces. Special cups are available for all types of grinding, smoothing, and polishing of base metals and other raw surfaces of different materials.



### Hopper-Fed Drilling and Deburring Machine

Drilling and deburring machine with a double feed which operates automatically has been an-



nounced by Inter-Lakes Engineering Co., Dept. M, 4845 Bellevue, Detroit 7, Mich. This machine is designed principally for second operations on screw machine parts up to 1 inch in diameter and 2

inches long. It operates automatically as long as the hopper is supplied with work, drilling holes at any angle desired. Production capacity is 3000 pieces per hour.

### Erick Magna-Holder for Indicators

Magnetic holder for indicators made by the Cullen Mfg. Co., Dept. M, Racine, Wis. This Erick Magna-Holder can be used with indicators up to 3 inches in diameter. Swivel joints and extensions permit positioning the indicator at any desired angle. A knurled head screw provides for precision lateral adjustment through a travel range of 1/2 inch. The Alnico magnets exert a pull of 50 pounds.



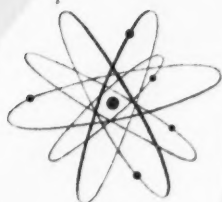


# <sup>®</sup> **ELECTRALIGN...**

... an exclusive  
precision work-  
aligning short-cut  
for Brown & Sharpe  
Grinding Machines

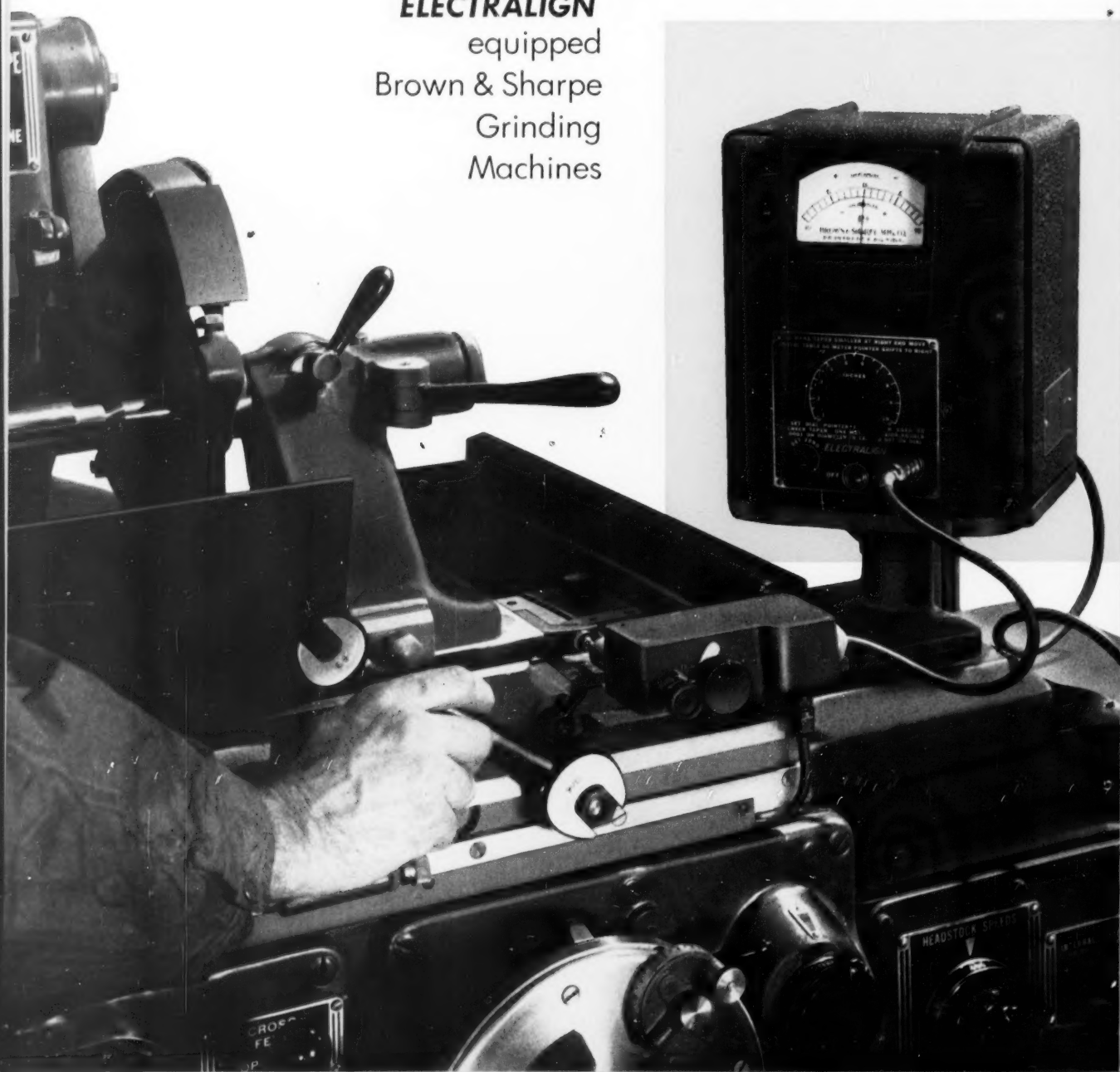


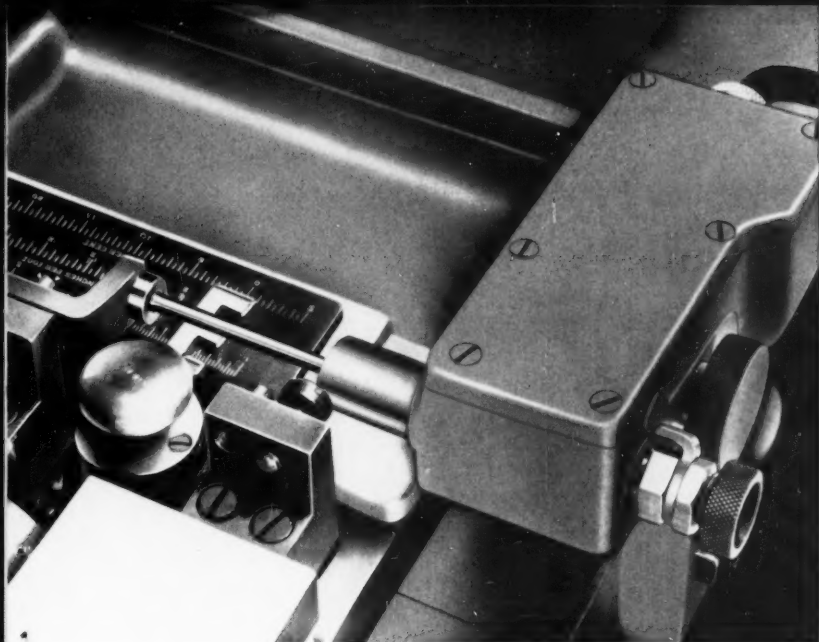
**Brown & Sharpe**



**You Get  
Swivel Table  
Alignment  
MAGNIFIED 1800 TIMES...**

... with  
**ELECTRALIGN**  
equipped  
Brown & Sharpe  
Grinding  
Machines





Setting gage permits simple adjustment for swivel table position. Highly-sensitive strain gages detect small displacements of the ends of the swivel table. An electronic amplifier magnifies movements to large scale . . . gives direct readings in .0001".

By electronically magnifying adjustments 1800 times, the unique ELECTRALIGN eliminates "cut and try" methods of aligning swivel tables on straight work or exact tapers. Your operators can immediately and easily establish correct swivel table alignment to within .0001", after only one preliminary grind. Moreover, ELECTRALIGN is always "on guard" . . . warns operator if a jar or vibration changes setting of swivel table. It simplifies and speeds your operator's task while doing much to eliminate work spoilage . . . particularly, where only .002" or .003" are left for finish grinding.

This exclusive Brown & Sharpe arrangement is so practical that alignment corrections may even be made during the grinding operation. Other time-saving advantages are illustrated on the following page. Write for complete details.

## ***Brown & Sharpe***

Reduces set-up and operating time . . . speeds production, and minimizes risk of work spoilage.

ELECTRALIGN is available on all Brown & Sharpe Universal and Plain Grinding Machines and the No. 13 Universal and Tool Grinding Machine. Illustrated is the New No. 1 Universal.



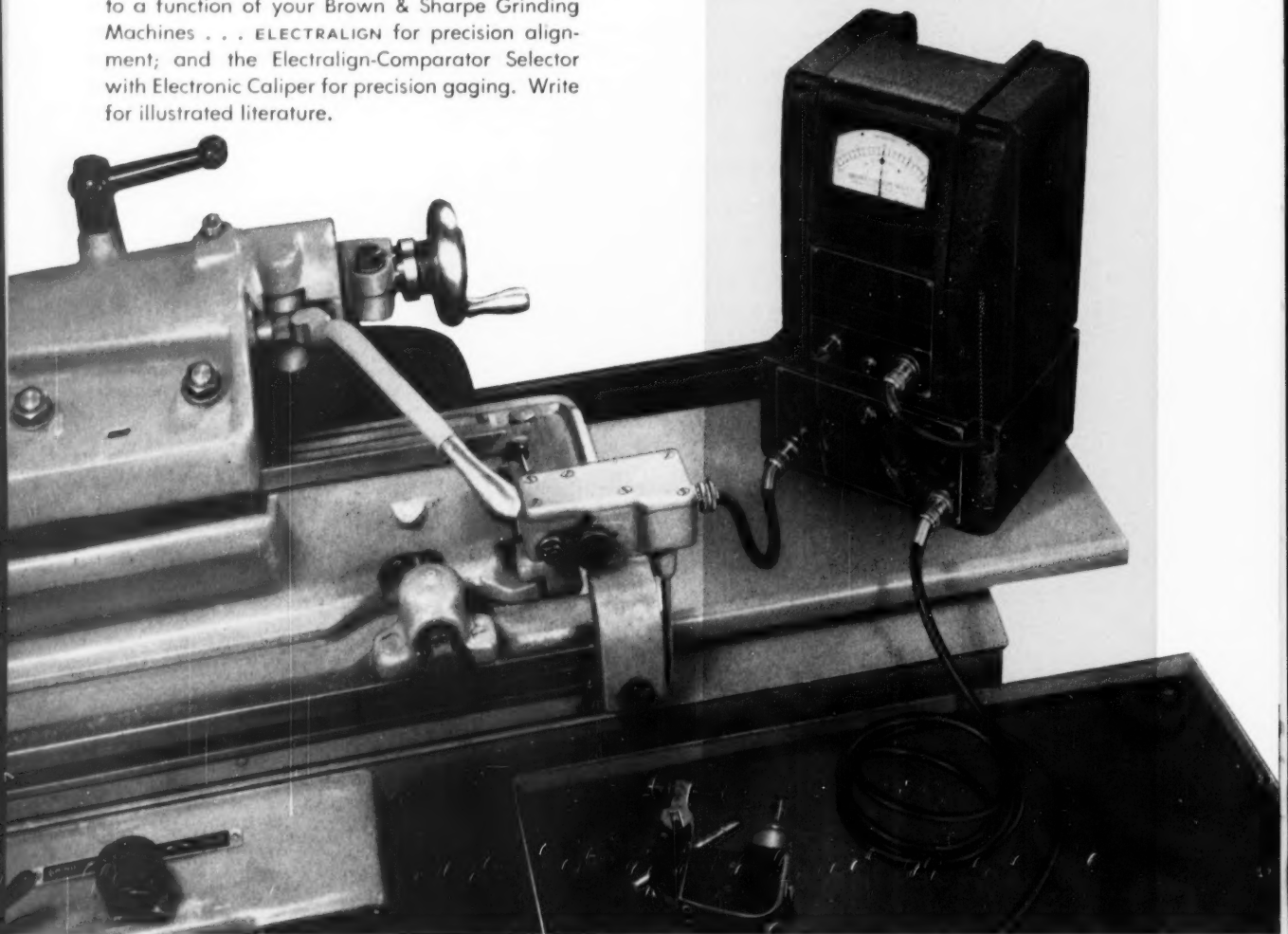


# ELECTRALIGN

Through the exclusive Electralign - Comparator Selector, used in conjunction with ELECTRALIGN, you can make external or internal measurements in .0001" to .00001" . . . often without removing the work from the machine! This equipment eliminates differences in measurement due to human "touch or feel" and can be used with comparator gages of standard or special design. It is illustrated with the Brown & Sharpe Electronic Caliper No. 955.

Here at last is a way to transfer craftsmen's skill to a function of your Brown & Sharpe Grinding Machines . . . ELECTRALIGN for precision alignment; and the Electralign-Comparator Selector with Electronic Caliper for precision gaging. Write for illustrated literature.

*permits combining  
precision work-  
alignment with  
precision gaging!*

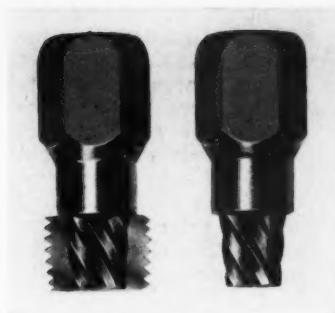


## **Brown & Sharpe**

Milling Machines • Grinding Machines • Screw Machines • Cutters • Machine Tool Accessories  
Machinists' Tools • Electronic Measuring Equipment • Johansson Gage Blocks • Permanent Magnet Chucks • Pumps

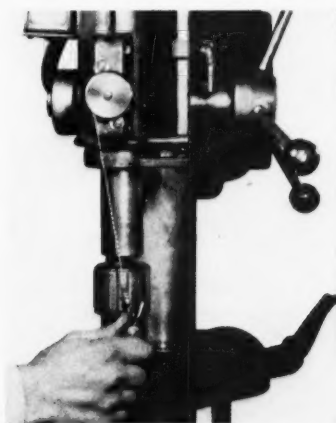
BROWN & SHARPE MFG. CO., PROVIDENCE 1, R. I., U. S. A.

PRINTED IN U. S. A.



### Tools for Extracting Broken Parts

Extracting tools designed to remove threaded broken parts without wedging them more tightly in the threaded hole, now being marketed by the Roddick Tool Co., Dept. M, 1023 N. Pauline St., Anaheim, Calif. The extractors are made to work with any fitting in the pipe, hydraulic, aircraft, plumbing, or mechanical fields, and are now available in a range of twenty sizes from 1/8 to 7/8 inch. They are designed to form teeth inside the hole until the shoulder contacts the part and permits a high torque without expanding the part. Hexagonal head permits turning with wrench.



### "Key-Bak" for Chuck Key

"Key-Bak" chain and reel designed to keep the chuck key handy and ready for use, thus eliminating time lost in searching for misplaced keys. The device is simply attached to the drill press, as shown, with the chuck key attached to the chain. The 24-inch long steel chain is retracted by a clock spring mechanism. Product of Lummis Mfg. Co., Dept. M, 2242 E. Foothill Blvd., Pasadena 8, Calif.

### Time Delay Switch

"Agaswitch" time delay switch developed by the AGA Division, Elastic Stop Nut Corporation of America, Dept. M, 1027 Newark Ave., Elizabeth 3, N. J., for applications where a mechanically or manually initiated time-delay switch is needed. This switch is operated by a lever rather than by solenoid action. Pressure against the lever trips the switch, and a time delay period from one-tenth of a second to about five minutes starts upon the release of



### Machine for Automatic Washing of Small Parts

Quick, automatic cleaning of small parts, complete assemblies, and tools is said to be possible with this power-operated washer produced by Kelite Products, Inc., Dept. M, 1250 N. Main St., Los Angeles 12, Calif. Cleaning is accomplished by the action of an oscillating turntable which is submerged in a cleaning solution. Parts to be cleaned are placed in a perforated basket which rides on the turntable, while complete assemblies, such as typewriters, are placed directly on the turntable. The speed of the washer can be varied from 0 to 240 oscillations per minute through a 1/4-H.P. air motor which is operated at pressures of from 30 to 120 pounds per square inch. The tank is extra heavy-gage steel, 20 by 20 by 15 inches.



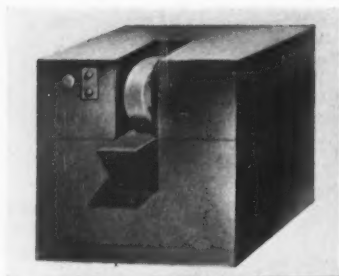
pressure on the lever. It is available in both single-pole double-break and double-pole single-break types, for resistance loads of approximately 15 amperes at 115 volts, 60 cycles. It is light in weight and compact, being 2 1/2 inches square by 3 inches high.

### "Metalized" Pressed Steel Heat-Treating Pots

"Metalized" pressed steel pots for heat-treating furnaces announced by the Eclipse Fuel Engineering Co., Dept. M, 1002 Buchanan St., Rockford, Ill. These pots are manufactured with three different coatings for temperatures up to 1500 degrees F.; from 1500 to

1700 degrees F.; and for over 1700 degrees F. The resistant coatings are said to protect the pressed steel surfaces against heat oxidation and scaling otherwise caused by hot gases encountered in high-temperature heat-treating operations.





### Induction Heaters for Preheating Extrusion Dies

Automatic 60-cycle induction die heater of line designed to preheat extrusion dies announced by Magnethermic Corporation, Dept. M, Youngstown, Ohio. With this induction heating equipment a small or medium sized die can be preheated in four to ten minutes. The unit now available is rated at 15 kilowatts. This heater will handle dies for most standard presses up through the 1500-ton sizes. The heater is arranged for operation on either 220- or 440-volt, 60-cycle circuits. Electrical wires are

the only connections necessary. Operation is automatic. The operator depresses a button to start the heater, after which the die is automatically heated to the predetermined temperature.



### Portable Riveter

Portable pneumatic riveter, called the "Airflex" Model SP, introduced by the Lemert Engineering

Co., Inc., Dept. M, 201 Jefferson St., Plymouth, Ind. Rotating impact is an outstanding feature of this hand tool, which is said to embody the manufacturer's Airflex principle of spin riveting. This tool requires only a slight steady pressure for proper operation, the riveter tending to feed itself. It does not require elaborate fixtures. The riveter can be used safely on fragile as well as ordinary materials. Made in three sizes to handle 1/8 to 5/16-inch rivets.

### Micro Snap-Action Precision Switch

One of two precision snap-action switches, designed for one-way actuation by cams, dogs, or slides, recently announced by the Micro Division, Minneapolis-Honeywell



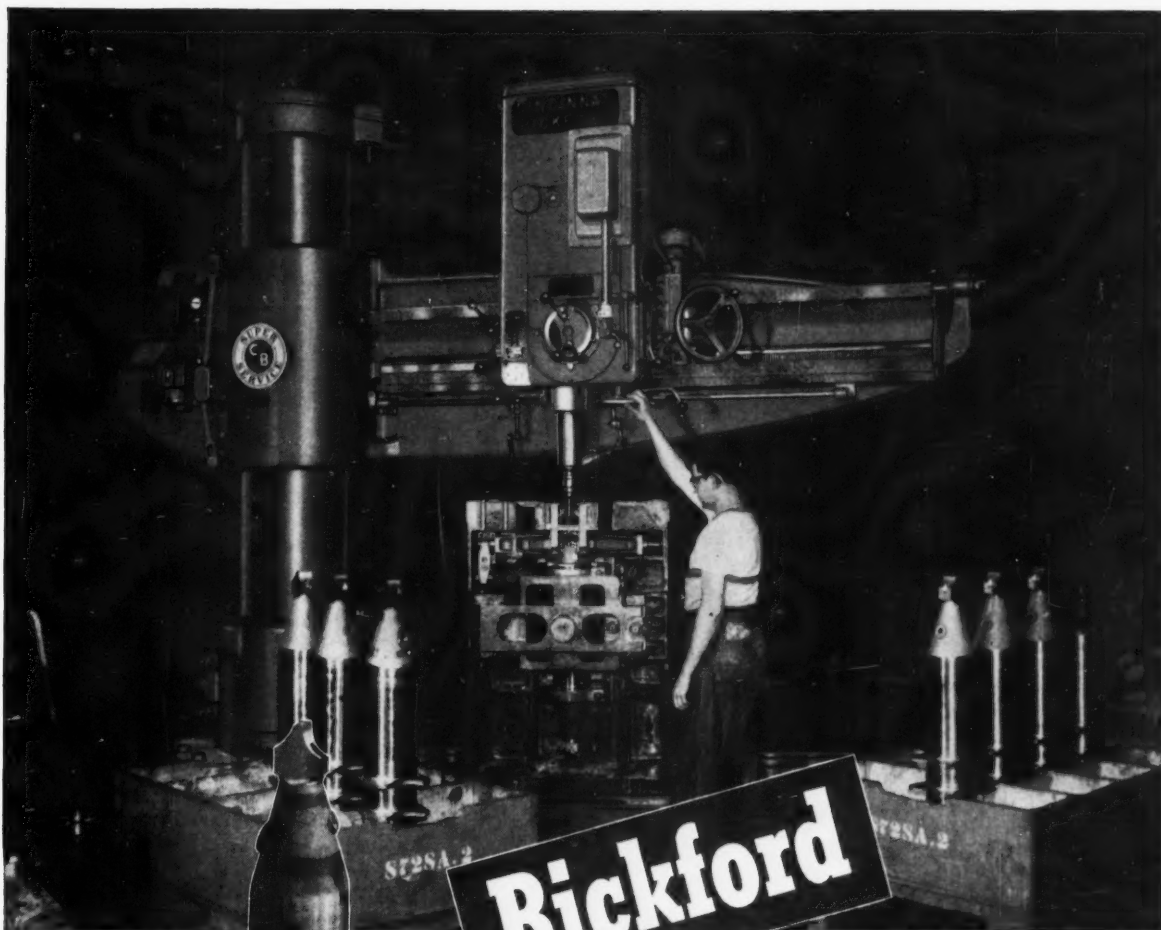
### Air Gage for Checking Jet-Engine Turbine Bucket Blades

Air gage assembly—for checking critical dimensions simultaneously on a jet-engine turbine bucket blade—developed by the Sheffield Corporation, Dept. M, Dayton 1, Ohio. An unskilled operator can quickly check blade taper in relation to root form at

three places along the leading and trailing edges and measure the length of the root form in one operation. The accuracy of each of the dimensions to be checked is indicated by the position of floats in the seven column "Precision-aire" gage.



Regulator Co., Dept. M, Freeport, Ill. These switches have spring-loaded, hinged roller arm actuators. One design has a roller 3/16 inch in diameter, the other a roller 3/8 inch in diameter. They are particularly useful in providing an electrical impulse to relays or solenoids controlling reciprocating movements. Either solder lug terminals or screw terminals for operation on various voltages are available. One model has a maximum operating force of 8 ounces, minimum release force of 1 1/2 ounces, and maximum differential travel of 0.015 inch. The other model has an operating force of 2 1/2 to 6 1/2 ounces, minimum release force of 1 1/4 ounces, and differential travel of 0.003 to 0.020 inch. Both switches have single-pole, double-throw contact arrangements.



Photos courtesy—  
The Cleveland Pneumatic  
Tool Company, Cleve-  
land, Ohio.

**Bickford**  
gives *complete* satisfaction...

The convenient centralized controls, the wide range of speeds and feeds, and the high visibility head of this Cincinnati Bickford Radial Drill are all contributing to fine performance on this job.

The Cleveland Pneumatic Tool Company say "Performance and ease of handling are all that could be desired."

On this cylinder for an aircraft nose type landing gear, drilling, reaming and spot facing operations are being done.

Cincinnati Super Service Radial Drills are accurate, powerful and profitable in the shop.

Write for Bulletin R-29.

.... **CINCINNATI  
BICKFORD**



RADIAL AND UPRIGHT DRILLING MACHINES

**THE CINCINNATI BICKFORD TOOL CO.**

Cincinnati 9, Ohio, U.S.A.





### Lightweight High-Capacity Roller Bearing

Self-aligning, torque tube type, double-row roller bearing, developed primarily for use in high-speed aircraft. This bearing is said to provide full freedom of rotation under all conditions of misalignment resulting from mounting inaccuracies and the usual flexing of airframe structural members during flight. The bearing is factory-lubricated and equipped with seals which perform the twofold duty of retaining lubricant and preventing air loss in pressurized aircraft. Other features of this bearing include simplicity and light weight, with minimum cross-section dimensions. Product of the Shafer Bearing Corporation, Dept. M, 801 Burlington Ave., Downers Grove, Ill.

### Direct-Current Arc Welder

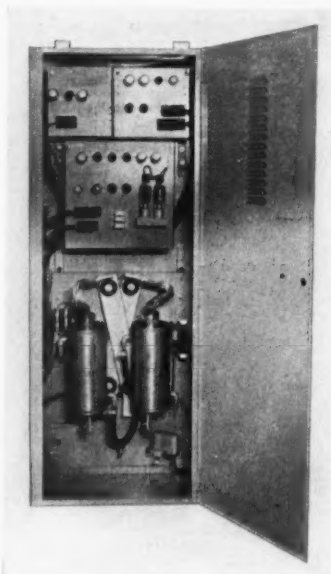
Direct-current rectifier welder brought out by the Metal & Thermit Corporation, Dept. M, 100 E.



42nd St., New York 17, N. Y. This machine is a heavy-duty unit built in ratings of 200, 300, and 400 amperes for continuous production welding. Fan-forced, up-draft ventilation provides cool operation and assures long rectifier life for the equipment.

### G-E Precision Control for Resistance Welding

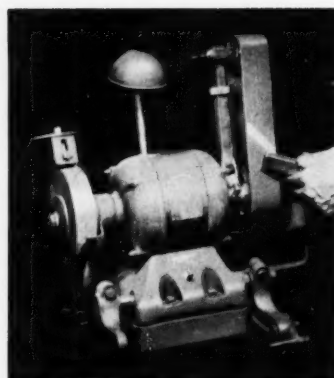
Synchronous precision control for fast resistance welding of hard-to-weld metals announced by the General Electric Co., Dept. M,



Schenectady 5, N. Y. This control is adaptable for bench, spot, seam, or combination welders, the simplified control being designed for reliability and long life. It accurately regulates the value of the current and length of time it flows, thus helping to assure high-quality welding, especially for high-speed applications where the weld current period is of short duration.

### Curtis "Adapt-A-Belt" Attachment

"Adapt-A-Belt" attachment for grinding and polishing operations. This attachment can be clamped on lathes, milling machines, drill presses, or pedestal grinders for rapid handling of jobs that do not warrant setting up a machine. It can also be attached to a portable air tool for use as a portable grinder. The abrasive belt can be used with dynamically balanced



rubber covered contact wheels in various diameters and widths, as well as with soft or hard cloth wheels. Model A-1 uses belts up to 1 inch wide, and weighs 2 1/4 pounds; Model A-2 will take belts up to 2 inches wide, and weighs 2 1/2 pounds. Product of Curtis Machine Corporation, Dept. M, Jamestown, N. Y.

### Direct-Reading Chamfer Micrometer Gage

Chamfer micrometer gage recently introduced by the Acme Industrial Co., Dept. M, 200 N. Laflin St., Chicago 7, Ill. This instrument is designed for direct reading of the end diameter of chamfers up to 1 inch, and of any amount of bevel up to a 90-degree included angle. The depth of chamfer in a hole can also be easily computed from the reading. A master check bar with a known indicated end diameter and chamfer is furnished for checking the calibrations of the micrometer.



# **HANDLE ALL YOUR EMULSIFYING CUTTING OIL NEEDS with S.E.C.O. and S.E.C.O. HD "F"**

## **Sunoco Emulsifying Cutting Oil — For general-purpose cutting and grinding.**

This product is more widely used in metal-working plants than any similar oil. It has high emulsion stability and cooling efficiency, excellent lubricating and rustproofing characteristics. Those features, plus low initial cost, make S.E.C.O. ideal for a wide range of machining, grinding and rolling operations on both ferrous and nonferrous metals.

## **Sunoco Emulsifying Cutting Oil HD "F"**

**— For heavy duty cutting.** Its extreme pressure properties give it a film strength more than twice that of regular emulsifying oils. This high film strength, plus increased "oiliness" characteristics, makes it ideal for machining jobs too tough for regular soluble oils and too hot for straight cutting oils. Emulsions of S.E.C.O. HD "F" are clean smelling and will remain so in service.

For complete data on S.E.C.O. and S.E.C.O. HD "F," call your nearest Sun office or write SUN OIL COMPANY, Philadelphia 3, Pa., Dept. M-9.

**INDUSTRIAL PRODUCTS DEPARTMENT  
SUN OIL COMPANY**

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### "Miti-Mite" Dial Indicator Holder with Magnetic Base

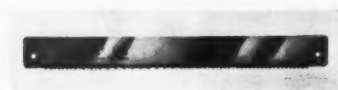
Dial indicator holder called the "Miti-Mite," which attaches itself instantly and securely to any round or flat iron or steel surface



by means of a powerful permanent magnet in the base. Attachments are available for holding practically all makes of dial indicators. The swivel action post can be quickly secured in position by a knurled lock-nut. This holder is adapted for use on lathes, shapers, milling machines, and planers. The permanent magnet of the regular model has a pull of 50 pounds. A heavy-duty model is also available with a magnet having a pull of 100 pounds. Product of Lufkin Rule Co., Dept. M, Saginaw, Mich.

### "Illinite" Metal-Sawing Blade for Power Cut-Off Machines

Blade for power sawing or cut-off machines marketed by the Illinois Tool Works, Dept. M, 2501 N. Keeler Ave., Chicago 39, Ill. This "Illinite" blade will be available in the sizes regularly used on



standard sawing machines. It is designed specifically to cut present-day metals at high speeds and feeds. Two types of blades will be available—a DuWeld composite blade with a high-speed steel cutting edge welded to a tough, shock-resistant chromium-vanadium steel back; and a specially heat-treated high-speed steel blade.

### Carbide Grinding Wheel

The Macklin Co., Dept. M, Jackson, Mich. is now producing an entirely new type of grinding

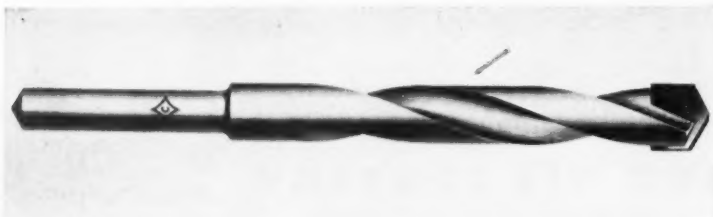


wheel identified by the symbol MM. This wheel has been developed for the rapid grinding of all types of cemented-carbide tools. It is said that metallurgical injury to the carbide is completely eliminated. A fine, loose abrasive is embedded, in pellet form, through-

### Carbide-Tipped Masonry Drill

Carbide-tipped masonry drill introduced by the Cleveland Twist Drill Co., Dept. M, 1242 E. 49th St., Cleveland 14, Ohio. Sizes range from 1/8 inch to 1 1/2 inches. It is designed for efficient drilling in stone, concrete, brick, marble, slate, and other kinds of

masonry. This drill can be used in drill presses or portable electric drills, preferably at the slowest speed available. With a hand brace, it can be used for drilling glazed tile if the hole is started by center punching the extremely hard surface.

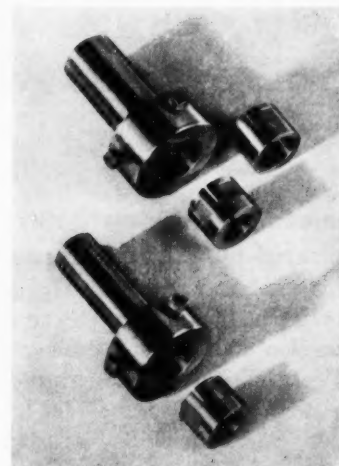


out the wheel and as the tool is applied to the wheel, this loose abrasive is constantly carried between the metal and the wheel.



### Granite Straightedge

Straightedge of black granite produced in lengths up to 48 inches by the Collins Microflat Co., Dept. M, 2326 E. 8th St., Los Angeles 21, Calif. These straightedges are designed for precision measurement and checking of machine tool beds and surfaces that must be flat within accuracy limits as close as 0.00005 inch. They have smooth surfaces that never require oiling. Also, the inherent characteristics of the black granite insures them against warping, deflecting, or rusting. The ends are tapered and fitted with leather grips.



### Tool Adapter for Automatic Screw Machine

Precision-ground tool adapter for Brown & Sharpe automatic screw machines announced by the American Cam Co., Inc., Dept. M, Hartford 1, Conn. With only two of these adapters in place of the conventional six, it is now possible to use No. 00 tools on No. 0 machines and either No. 00 or No. 0 tools on No. 2 machines. Thus the adapters afford broader use of smaller size automatic screw machine tools.



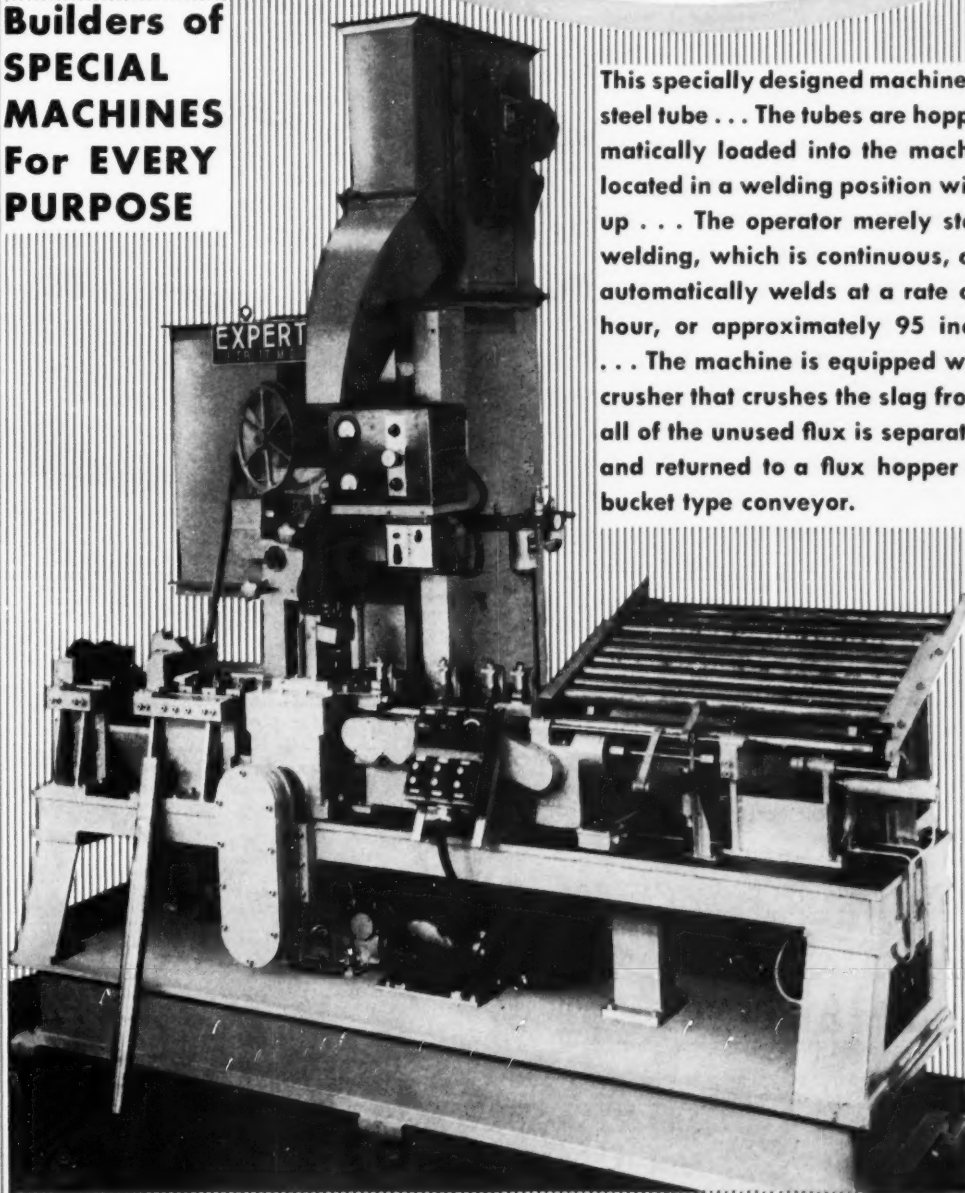
**A CONTINUOUS AUTOMATIC SUBMERGED**

# *Arc Welding Machine*

**FOR ANY LENGTH OF TUBING**

**Builders of  
SPECIAL  
MACHINES  
For EVERY  
PURPOSE**

This specially designed machine welds a 42-inch steel tube . . . The tubes are hopper fed and automatically loaded into the machine, turned and located in a welding position with the seam side up . . . The operator merely starts the cycle of welding, which is continuous, and the machine automatically welds at a rate of 136 tubes per hour, or approximately 95 inches per minute . . . The machine is equipped with an automatic crusher that crushes the slag from the weld, and all of the unused flux is separated from the slag and returned to a flux hopper by means of a bucket type conveyor.



FOR FURTHER INFORMATION CONTACT

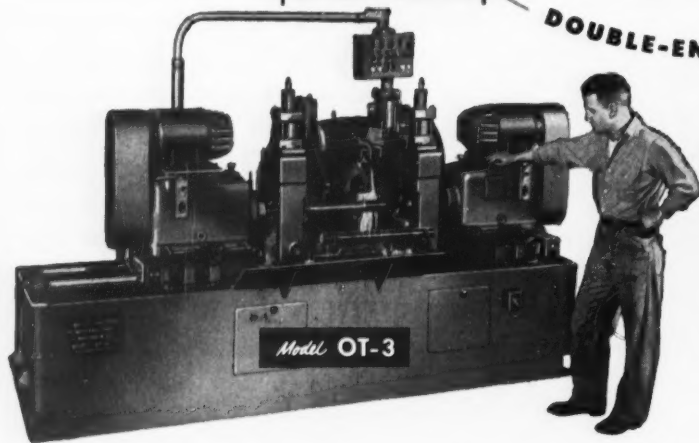
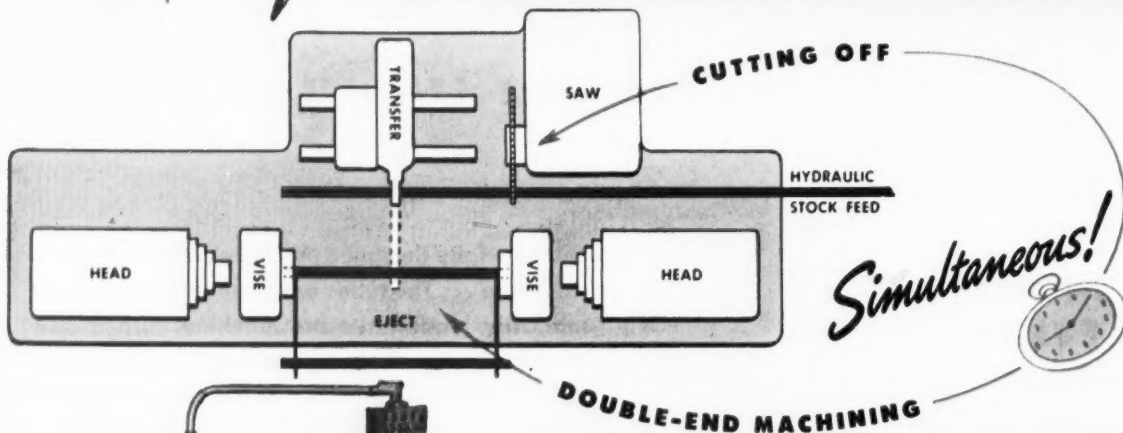
**EXPERT WELDING MACHINE CO.**

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# Variety..

**CUT OFF while you DOUBLE-END MACHINE**  
**ON NOTCH & MERRYWEATHER**  
**AUTOMATIC TRANSFER MACHINES!**



**BORE • FACE • CHAMFER • CENTER  
 DRILL • TURN • REAM • GROOVE**  
 and other operations, singly  
 or "unitized"

**MP/SF**  
 Most Production per Square Foot

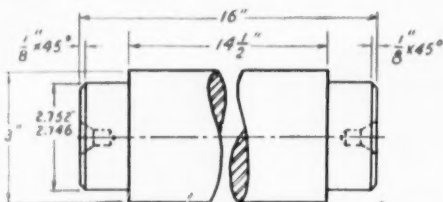
**PROFIT** **REDUCE COSTS...** Three or four machines in one. Cut off to accurate length and double-end machine simultaneously. Cut-off time is virtually "free". Change-over quick from job to job! Ideal for short or production runs. Cycle fully automatic. Remember: it's the cost per piece that counts.

## Case Study No. 182

**Operation:** Cut off, box mill, turn and center drill both ends.

**Material:** SAE 1020.

**Production:** 110 pieces per hr.



| SPECIFICATIONS        |             |             |             |
|-----------------------|-------------|-------------|-------------|
| ITEM                  | Model OT-3  | Model OT-4½ | Model 2T-6  |
| Rated diameter stock  | ½" to 3"    | ¾" to 4½"   | 1" to 6"    |
| *Standard work length | 8" to 40"   | 8" to 40"   | 8" to 40"   |
| Weight (approximate)  | 11,500 lbs. | 15,000 lbs. | 26,000 lbs. |

\*Work length can be increased by special arrangement.  
 NOTE: Supplied for ferrous or non-ferrous applications.

Manufactured by — **THE NOTCH & MERRYWEATHER MACHINERY CO.** —  
 CLEVELAND 13, OHIO

Builders of Circular Sawing Equipment, Production Milling, Turning and Special Machines

**PRODUCTION-WITH-ACCURACY MACHINES AND EQUIPMENT**



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On New Catalogues described in this issue of **MACHINERY**

On products mentioned in the editorial pages

On products shown in the advertisements

## NEW CATALOGUES

**MEASURING INSTRUMENTS**—Brush Electronics Co., Sales Promotion Department, 3405 Perkins Ave., Cleveland 14, Ohio. 34-page book entitled "Instruments for Modern Measurements," containing concise descriptions of thirty-seven different instruments designed to meet exacting requirements of research laboratories. Can be obtained when requested on a company letterhead direct to the above address.

**INSTRUMENT BALL BEARINGS**—New Department Division of General Motors Corporation, Bristol, Conn. Booklet A1B dealing with the classification, design, and operating requirements of small, precision instrument ball bearings. Typical applications are given. Can be obtained when requested on a business letterhead direct to the Division.

**MEASURING EQUIPMENT**—General Electric Co., Schenectady, N. Y. Bulletin GEC-1016A, the second edition of a 64-page catalogue on measuring equipment for laboratory and production testing, including radiation instruments. Brief descriptions of each product and its field of application, together with condensed tables of important characteristics are aimed to guide users in selecting equipment to meet measuring requirements. .... 1

**HYDRAULIC OIL SELECTION**—Vickers Inc., Detroit, Mich. Bulletin 1300-S, covering recommendations for hydraulic oil selection and basic hydraulic system maintenance on machine tools and other industrial machinery. A table of common hydraulic system difficulties and corrective action for them is presented. .... 2

**PRECISION DOUBLE-SPINDLE GRINDERS**—Gardner Machine Co., Beloit, Wis. Catalogue D-53, containing data on the company's line of precision double-spindle grinders, as well as concise descriptions of sixteen Gardner work-carrying fixtures which can be adapted to these machines. The catalogue is available to production officials. .... 3

**LOAD WEIGHING SYSTEM**—Baldwin-Lima-Hamilton Corporation, Philadelphia, Pa. Bulletin 4106, explaining how to weigh the contents of tanks, bins, and hoppers electronically with Baldwin SR-4 load cells. A questionnaire to be used as a guide for tank weighing inquiries is included. .... 4

**ARC-WELDING MACHINES**—Air Reduction Sales Co., New York City. Catalogue 1340, describing in 44 pages over twenty different models of arc-welding machines, and giving specifications, features, and electrical data. Also discussed are various types of running gear, foot controls, and an automatic arc-welding head. .... 5

**WORK-CLEANING BARRELS**—Pangborn Corporation, Hagerstown, Md. Bulletin 223-A, presenting specification information on two new sizes of Blastmaster barrels, and showing how savings may be realized by using Blastmaster barrels for batch blast cleaning of castings, forgings, and heat-treated parts. 6

**ELECTRONIC CONTROLS**—Photoswitch Inc., Cambridge, Mass. Booklet 2 entitled "Cutting Production Costs with Electronic Controls," presenting forty-six case studies which illustrate how packaged electronic controls have solved many problems of weighing, counting, measuring, timing, and cycling. .... 7

**BELT CONVEYOR IDLERS**—Link-Belt Co., Chicago, Ill. Book 2416, providing detailed information on thirty-four types of belt conveyor idlers. Schematic drawings and dimensional data are included for each type of idler. Also, a new variable troughing idler is introduced. .... 8

**CUTLESS RUBBER BEARINGS**—Lucian Q. Moffitt, Inc., Akron, Ohio. 33-page catalogue describing B. F. Goodrich cutless rubber bearings that are recommended for use in any industrial equipment where bearings can be lubricated with water or by the liquid handled in the equipment. .... 9

**TOOL INVENTORY**—Carboloy Department of General Electric Co., Detroit, Mich. Folder designed to show tool-room supervisors and managers how they can reduce by as much as one-third their tungsten-carbide tool inventories, a plan resulting from the Department's study of this subject. .... 10

**ALUMINUM IN PROCESS INDUSTRIES**—Aluminum Company of America, Pittsburgh, Pa. Booklet AD-278 entitled "Alcoa Aluminum in the Process Industries," giving engineering information on composition and properties of aluminum alloys and their uses in the process industries. .... 11

**SMALL INDUSTRIAL PUMPS**—Tuthill Pump Co., Chicago, Ill. Catalogue 101, on the company's Model L series of small industrial pumps designed for lubricating, hydraulic, transfer, circulating, and oil burning services. A pump guide contains operating and service data. .... 12

**MODERNIZING OLDER PRESSES**—E. W. Bliss Co., Canton, Ohio. Bulletin 45, consisting of recommendations for the modernization of old Bliss-built straight side and gap frame single-crank presses. "Before" and "after" views illustrate forty-two conversion assemblies available. .... 13

**GAGING CARTRIDGES**—Sheffield Corporation, Dayton, Ohio. 24-page booklet illustrating and

describing many applications of "Plunjet" gaging cartridges which may be used in conjunction with column and dial type Precision-Aire gages and other air gages. .... 14

**CUTTING-OFF BLADES**—Pratt & Whitney Division Niles-Bement-Pond Co., West Hartford, Conn. Circular 561, descriptive of P & W cutting-off blades for varied uses. Illustrated also are special design blades made by the company for unusual applications. .... 15

**SMALL-MOTOR SERVICE STATION PLAN**—General Electric Co., Schenectady, N. Y. Bulletin GEC-972, describing the new G-E motor service plan for fractional- and integral-horsepower motors and generators, and listing over 125 authorized stations in the United States and Canada. .... 16

**GEARS IN INDUSTRY**—Cone-Drive Gears Division, Michigan Tool Co., Detroit, Mich. Bulletin CD-173 entitled "Cone-Drive Gears at Work in Industry." Described in 36 pages are typical applications of standard Cone-Drive gears in twenty different industries. .... 17

**FORGINGS**—Mueller Brass Co., Port Huron, Mich. Catalogue containing detailed information on the company's brass, bronze, and aluminum forgings, such as physical characteristics, forging methods, and factors in design and in machining. .... 18

**ALUMINUM ROLL-FORMED SHAPES**—Reynolds Metals Co., Louisville, Ky. Booklet explaining the advantages of Reynolds aluminum continuous roll-formed shapes, and giving examples of parts produced by the company's fabricating service. .... 19

**FILTERS**—Cuno Engineering Corporation, Meriden, Conn. Bulletin MK-0553, descriptive of the company's line of Micro-Klean filters for liquid applications. Case studies, hydraulic data, and a selector chart are included. .... 20

**HACK AND BAND SAWING**—Clemson Bros., Inc., Middletown, N. Y. Booklet giving suggestions for the proper selection and use of

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hand and power hacksaw blades and flexible back band saws. Hints on how to improve metal cutting are given. .... 21

**HIGH-SPEED STEEL MILLING CUTTERS**—Godard & Godard Co., Detroit, Mich. Condensed Catalogue 2, containing 52 pages of information on the company's standard solid high-speed steel milling cutters and also end-mill holders. .... 22

**SHEET-METAL FABRICATOR**—Wales-Strippit Corporation, North Tonawanda, N. Y. Catalogue 10-AA, describing and illustrating the Wales sheet-metal fabricator for punching, notching, and nibbling up to 165 strokes a minute. .... 23

**HYDRAULIC TUBING**—Joseph T. Ryerson & Son, Inc., Chicago, Ill. Bulletin 12-2, containing technical information on Ryerson hydraulic fluid line tubing (cold-drawn seamless steel) especially processed for use in hydraulic systems. .... 24

**CONTRACT MANUFACTURING**—Hartford Special Machinery Co., Hartford, Conn. Bulletin E-201, providing a comprehensive picture of the company for contract manufacturing of a wide range of products. .... 25

**DISC GRINDERS**—Mattison Machine Works, Rockford, Ill. Bulletin 647-2RM, pertaining to the Mattison (Hanchett type) double-spindle production disc grinders, in which features and applications are concisely described. .... 26

**MINIATURE BALL BEARINGS**—Miniature Precision Bearings, Inc., Keene, N. H. Booklet giving comprehensive design and application data on miniature ball bearings intended to help the designer in selecting them. .... 27

**RESISTANCE-WELDING CONTROLS**—General Electric Co., Schenectady 5, N. Y. Bulletin GEA-5945, explaining what synchronous precision control for resistance welding is, and how it can be used for all kinds of resistance welders. .... 28

**INDUCTION HEATING EQUIPMENT**—Lepel High Frequency Laboratories, Inc., Woodside, N. Y. Catalogue illustrating some applications of Lepel induction heating equipment to demonstrate how metal-heating jobs can be performed economically. .... 29

**STANDARD THREAD GAGES**—Detroit Tap & Tool Co., Base Line, Mich. Bulletin SG-53, containing prices of Detroit thread plug and ring gages. Tables of tolerances for thread gages are given. .... 30

**SPACING DEVICES**—Hartford Special Machinery Co., Hartford, Conn. Bulletin S-103, containing complete information on the 8- and 12-inch Super-Spacers for grinding, boring, and miscellaneous operations. .... 31

**DRILL JIG BUSHINGS**—Colonial Bushings, Inc., Fraser, Mich. Price List B-649-A, containing prices for the company's standard drill jig bushings and liners, as well as dimensions and tolerances for all sizes. .... 32

**MILLING MACHINES**—Sundstrand Machine Tool Co., Rockford, Ill. Booklet describing and illustrating some typical uses of Sundstrand vertical rotary Rigidmill milling machines. Dimensions are included. .... 33

**BRONZE BEARINGS AND BARS**—Bunting Brass & Bronze Co., Toledo, Ohio. Catalogue 152, listing the company's cast bronze bearings, tubular and solid cast bronze bars, and electric motor bearings. .... 34

**DRAFTING MACHINES**—Charles Bruning Co., Inc., Chicago, Ill. Booklet descriptive of the Bruning Drafter in which the various details of this drafting machine are illustrated. .... 35

**STEEL SHOT ABRASIVE**—American Wheelabrator & Equipment Corporation, Mishawaka, Ind. Bulletin 89, descriptive of Wheelabrator steel shot, a new blast cleaning and peening abrasive. .... 36

**MAINTENANCE OF AIR TOOLS**—Rotor Tool Co., Cleveland, Ohio. Bulletin entitled "Keep 'Em Cutting," containing a plan for better maintenance and longer life for all air tools. .... 37

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**FELT FOR INDUSTRIAL PURPOSES**—Felters Co., Boston, Mass. Folder giving recommended uses for Felters precision cut felt parts, and including specification tables and samples. 39

**AUTOMATIC TURRET LATHES**—Potter & Johnston Co., Pawtucket, R. I. Bulletin 145, on the Model 3 U Speed-Flex automatic turret lathe designed for high-speed production of small parts. .... 40

**SLIDE CHART FOR SPLINE PLUG AND RING GAGES**—Vincos, Detroit, Mich. Slide chart giving the basic tolerances for spline plug and ring gages having pitch diameters up to 8 inches. .... 41

**CARBIDE-TIPPED TOOLS**—Super Tool Co., Detroit, Mich. Circular 531, giving specifications and prices of Super standard carbide-tipped tools for turning, facing, threading, and boring operations. .... 42

**ELECTRIC CLUTCH CONTROLS**—Micro Switch, Freeport, Ill. Catalogue 59, descriptive of Microswitch controls and auxiliaries which provide a means of electric clutch control for any manually operated power machine. .... 43

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**AIR VALVES**—Mechanical Air Controls, Inc., Detroit, Mich. Catalogue 53, giving complete data on "Mac" solenoid, foot, and cam-operated air valves. .... 45

**CARBIDE TOOLS**—Adamas Carbide Corporation, Harrison, N. J. Catalogue an eleven new styles in the Adamas line of single-point standard carbide tools. .... 46

**SELENIUM PLATING RECTIFIERS**—Accurate Engineering Co., Chicago, Ill. Bulletin 400, pertaining to the company's line of selenium rectifiers for electroplating and anodizing. 47

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**TURRET LATHES**—South Bend Lathe Works, South Bend, Ind. Catalogue 5312, describing and illustrating the South Bend No. 2-H turret lathe for the manufacture of duplicate parts. .... 49

**PRECISION TOOL-ROOM LATHE**—Rivett Lathe & Grinder, Inc., Boston, Mass. Catalogue 1020B, featuring the Model 1020 12-inch swing precision tool-room lathe. .... 50

**CLAD STEEL CONVERSION DATA**—Lukens Steel Co., Coatesville, Pa. Data card presenting conversion tables and theoretical weights for clad steel plates. .... 51

**TESTING MACHINES**—Tinius Olsen Testing Machine Co., Willow Grove, Pa. Bulletin 47, giving detailed information on Olsen Super "L" universal testing machines. .... 52

**PLASTICS PROCESSING**—Bassons Industries Corporation, New York City. Folder descriptive of the company's facilities for manufacturing reinforced plastic products. .... 53

**FIXTURE CLAMPS**—Siewek Tool Co., Detroit, Mich. Catalogue 8, covering the company's line of "Engineered" fixture clamps in various sizes and styles. .... 54

**RADIAL DRILLS**—Morris Machine Tool Co., Cincinnati, Ohio. Booklet featuring 11-inch column, 3-, 4-, 5-, and 6-foot arm Mor-Speed radial drills. .... 55

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**TITANIUM**—Mallory-Sharon Titanium Corporation, Niles, Ohio. Booklet containing detailed suggestions for the preliminary machining of titanium. .... 57

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**REAMERS**—Lavall & Ide, Inc., Chicopee, Mass. Pocket-size selector, listing 143 hole sizes that can be machined with L & I reamers. .... 61

**HYDRAULIC JACKS**—Duff-Norton Mfg. Co., Pittsburgh, Pa. Leaflet descriptive of a 35-ton hydraulic journal jack. .... 62

## Product Information Service

Use postage-free Business Reply Card below for further information concerning New Catalogues described in this issue and products mentioned in the editorial pages or advertisements.

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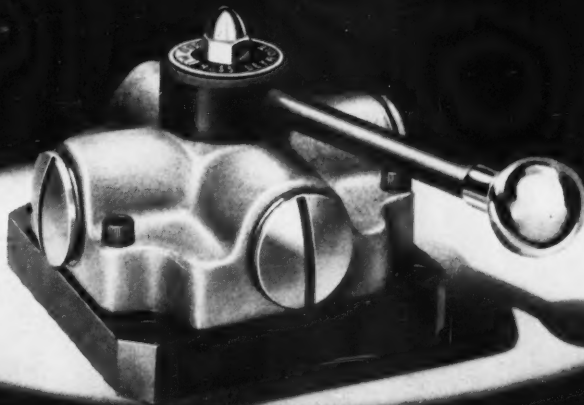
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**IT'S NEW . . .**

**IT'S FOR MACHINE TOOLS . . .**

*it's a "pancake"—2" high*



## **ROSS** Introduces Poppet Valve *with Rotary Handle Action*

- Seals with air pressure
- Easy to operate
- Smartly styled, clean and neat in appearance
- A 4-way unit available in  $\frac{1}{4}$  and  $\frac{1}{2}$ -inch pipe sizes

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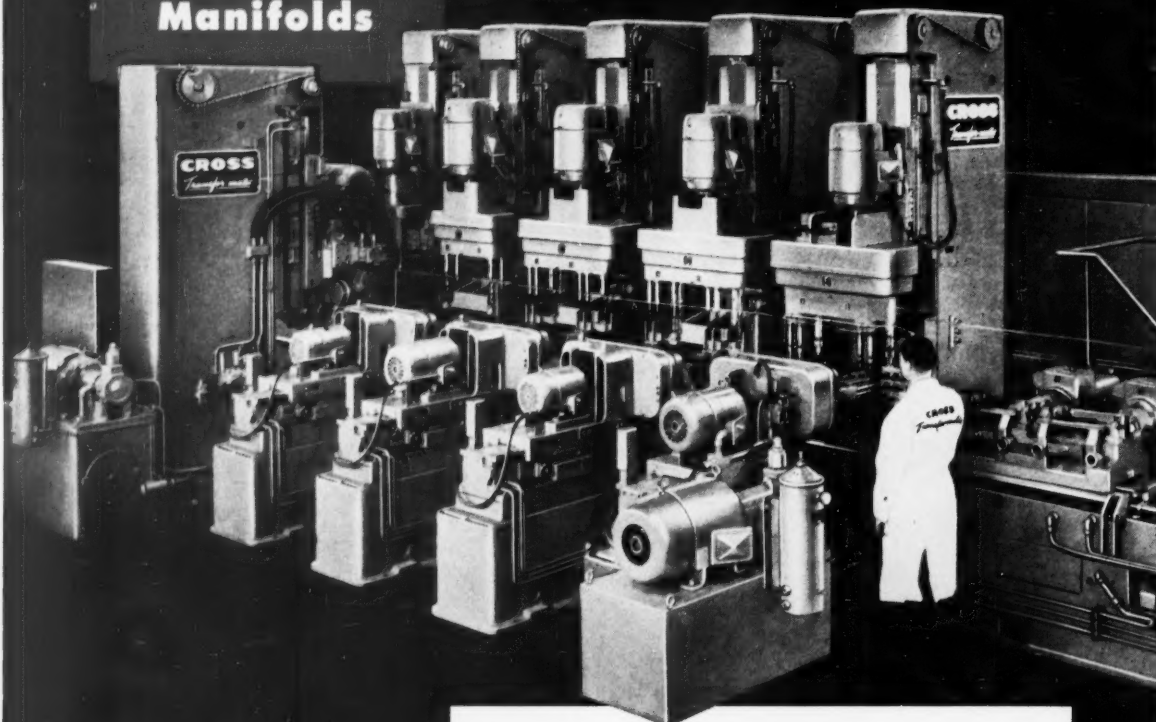
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**Drills,  
Bores, Mills,  
Intake  
Manifolds**

*Another Transfer-matic by Cross*



- ★ 218 parts per hour at 100% efficiency.
- ★ Seven stations including loading and unloading.
- ★ 54 operations—22 drilling, 8 chamfering, 2 reaming, 12 tapping, 8 boring and 2 milling.
- ★ Two parts machined at one time in each station.
- ★ Palletized work holding fixtures and automatic transfer from station to station.
- ★ Power wrenches for automatically operating work holding fixtures.
- ★ Other features: Pre-set tools, built-in chip conveyor, automatic cleaning unit for removing chips from fixtures, J.I.C. Standard Construction.

Established 1898

THE **CROSS** CO.  
DETROIT 7, MICHIGAN  
*Special* MACHINE TOOLS



# Between Grinds

By E. S. Salichs

## A Popsicle from the Postman

Mail is being pushed in aluminum carts by mail carriers in four cities, an innovation of the U. S. Post Office. By taking the heavy pack off the postman's shoulders, his time on the route is being cut an hour or more. Now the enterprising mailman might string bells on his cart and dispense ice cream sticks along with his mail.

## The Link

A company in Iowa that has been making precision steel castings primarily for jet planes recently merged with a soap concern. "Why would a steel company want to go into the soap business?" asked the Federal District judge. The steel company had the answer: "We want

to diversify and think that a product needed in every household offers a good prospect." The judge seemed to be seeking kinship between two such different products—had he ever stepped on a cake of wet soap he would have recognized the fact that fast propulsion was the common bond.

## Better than Beads

Chippewa Indians are adapting their manual dexterity to industry. The Simpson Electric Co. has established a branch plant near the Lac du Flambeau Reservation in Wisconsin, and the Bulova Watch Co. a plant near the Turtle Mountain Reservation in North Dakota. Braves and squaws are learning to manufacture voltmeters for

Simpson and watch jewels for Bulova.

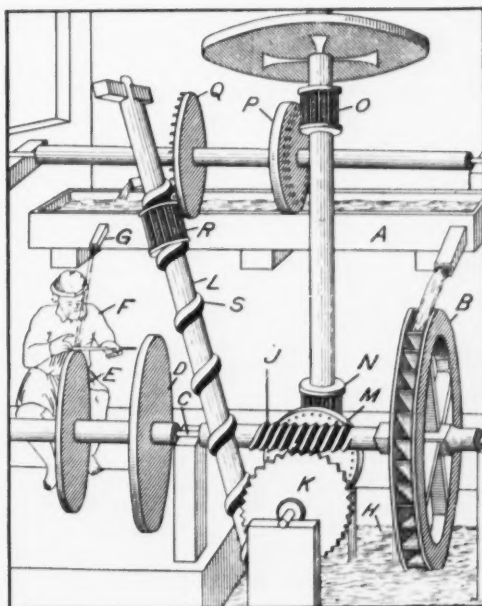
## The Lamb's Gambs

Sheep leg bones are used by the Western Electric Co., Inc., in the hardening of small metal parts, the carbon in the bones being the *pièce de résistance*. WE, the company's house organ, reveals that the source of supply for this by-product is the button-making trade, and that button-makers prefer sheep bones to other kinds.

## A Challenge?

In the rough proof of an article appearing in this number, the term *suitable clearance* had been set by the printer *spittable clearance*.

A PRIMITIVE GRINDING SCENE—Grits and Grinds, technical house organ of the Norton Co., ran this illustration under the somewhat cryptic caption "A Sixteenth Century Grinding Department—copper engraving by Strada, 1580." With Norton's indulgence we are reprinting it, having added our own reference letters to better reconstruct operations. Evidently water from the trough A drove the over-shot wheel B which turned the grinding shaft C. On shaft C were two wheels D and E. Toolmaker F (Local Guild 4) seems happy in his work but his beard looks as though it had tangled with one of the wheels at some time or other. The integral coolant system, consisting of the spout G, showed real foresight. Even the toolmaker's feet were cooled by the water en route to the sump H. And to return the coolant to the trough, the shaft C also carried a worm J. Meshing with gear K, the drive was transmitted to shaft L through pinion M, "lantern" gears N and O, pinions P and Q, and "lantern" gear R. How the water was impelled up the spiral pipe S is somewhat vague, but there it is trickling out of the top of the pipe.



# News OF THE INDUSTRY

## California and Oregon

DOUGLAS M. JONES, formerly assistant chief engineer and technical consultant of the Axelson Mfg. Co., Division of Pressed Steel Car Co., Inc., Los Angeles, Calif., has been promoted to the position of chief engineer. He succeeds GLYNN H.



Douglas M. Jones, chief engineer of the Axelson Mfg. Co.

WILLIAMS, who has been advanced to a special production engineering post. Mr. Jones has been with Axelson since 1936.

T. WAYNE GEHAN has been transferred from the San Francisco to the Los Angeles, Calif., office of the Whitney Chain Co., Hartford, Conn. He is a power transmission sales engineer. DONALD E. BOOSE has been appointed to Los Angeles in a similar capacity.

NORTHROP AIRCRAFT, INC., Hawthorne, Calif., has awarded a license to the HUFFORD MACHINE WORKS, INC., El Segundo, Calif., to manufacture and market a Northrop-developed flexible stretch form-block used as a machine attachment with stretch presses.

GEORGE A. BANTON was recently named district manager of the San Francisco, Calif., office of the Whitney Chain Co., Hartford, Conn., and GEORGE F. HAAG was made West Coast consultant.

MACHINISTS' TOOL & SUPPLY Co., 3690 Santa Fe Ave., Los Angeles 58, Calif., has been appointed distributor by the READY TOOL Co., Bridgeport, Conn.

HANCHETT MFG. Co., Big Rapids, Mich., has begun construction of a building at Macadam Ave. and Flower St., Portland, Ore., which will house a factory, warehouse for replacement parts, and sales offices to serve the West Coast.

## Illinois

H. J. HOLQUIST and E. J. RICHARDSON have been appointed assistant managers of the cold-finished bar division of Joseph T. Ryerson & Son, Inc., Chicago, Ill. Both men have been connected with the division in a sales capacity—Mr. Holquist at Chicago, Ill., and Mr. Richardson at New York City. They will continue to make their headquarters at these cities, the former supervising cold-finished bar sales activities in the Midwest, and the latter in the East. A. P. BECKLOFF, manager of the tubular products division, has assumed the added responsibility of cold-finished bar sales at all Ryerson plants, and this division will be known as the tubular products and cold-finished bar division.

RUSSELL, BURDSALL & WARD BOLT AND NUT Co., Port Chester, N. Y., announces the following sales staff changes: JAMES M. DILL, assistant vice-president of sales in charge of the Chicago, Ill., office, recently retired, and is succeeded by THOMAS TOBY; WILLARD B. DUNHAM was appointed manager of western distributor sales, with headquarters in Chicago; and VERNON N. PAULSON was named manager of western industrial sales, his headquarters having been moved from Chicago to Rock Falls, Ill.

SCULLY-JONES & Co., Chicago, Ill., announces the appointment of the following distributors for their line of precision holding tools: E. A. KINSEY Co., INC., 16 Washington St., Dayton, Ohio; JAMES H. CROSS Co., 2765 W. 8th St., Erie, Pa.; and HARRIS PUMP & SUPPLY Co., Brady and Sidney Sts., Pittsburgh, Pa.

GERALD R. GONYER was recently appointed manager of the Chicago, Ill., office of the Farrel-Birmingham

Co., Inc., Ansonia, Conn. He succeeds HARRY D. TEMPORAL, who is retiring after forty-three years with the company. Mr. Gonyer was assistant manager prior to his promotion.

ED KELLY, who has been with Greenlee Bros. & Co., Rockford, Ill., for twenty-three years, recently re-



Harold V. Bailey, new sales manager at Greenlee Bros. & Co.

tired. Mr. Kelly was sales manager of the screw machine department since 1943. HAROLD V. BAILEY, who has been assistant sales manager in this department for the last three years, succeeds Mr. Kelly. Mr. Bailey has been with Greenlee for twenty years, traveling widely in a sales capacity in this country and Europe.

CHAIN BELT Co., Milwaukee, Wis., announces the purchase of the SHAFER BEARING CORPORATION, Downers Grove, Ill., manufacturer of industrial roller bearings. The newly acquired concern will operate as the Shafer Bearing Division.

ROBERT E. OSCAR has been appointed export manager of the Pro-cunier Safety Chuck Co., Chicago, Ill., manufacturer of a complete line of tapping equipment. Export department facilities are located at 38 S. Dearborn St., Chicago 3, Ill.

RIGIDIZED METALS CORPORATION, Buffalo, N. Y., manufacturer of Rigid-Tex metal, has appointed

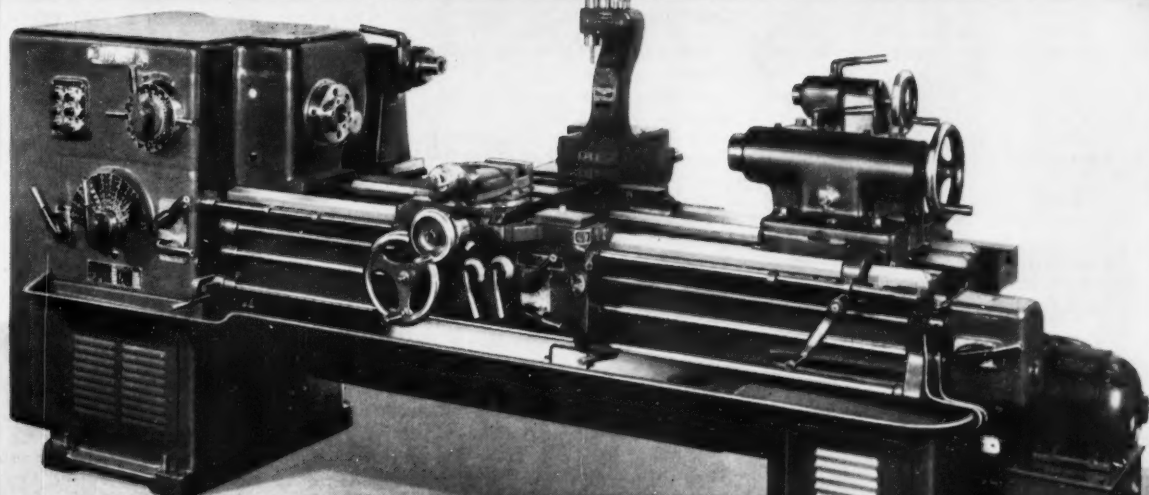
A LOOK TO SIDNEY  
IS A LOOK IN THE  
RIGHT DIRECTION

FOR  
INCREASED PRODUCTION  
AND  
LOWER COSTS

## WHY? — Because here are the points of superiority of **SIDNEY HEAVY-DUTY LATHES**

① Change gears rotate on anti-friction bearings and are mounted on fixed centers. Driving sheave is mounted on pre-loaded anti-friction bearings and is full floating on sleeve bolted to back of headstock, which eliminates drive shaft deflection.

② All-herringbone geared headstock provides 32 pre-selective changes of spindle speeds through convenient dial control. Spindle and intermediate shafts are equipped with center bearings in addition to end bearings. Spindle mounting automatically compensates for expansion caused by temperature rise.



③ Sidney's totally enclosed dial controlled gear box provides 60 changes of threads and feeds. All moving parts run constantly in oil.

④ Controls are conveniently located for comfortable operation. Off-set compound—extra large micrometer dials—thumb screw dial lock. Notice also the four swivel hold-down bolts for added rigidity.

⑤ Rigid four-wall bed construction with double cross girts spaced at 12" intervals. Casting is of semi-steel nickel mixture for close grain structure.

WRITE FOR BULLETINS

**SIDNEY FLUID TRACER LATHES** furnish greater versatility, wider range of work, unlimited reproduction true to form in every detail.

**THE SIDNEY MACHINE TOOL CO. • SIDNEY, OHIO**  
*Builders of Precision Machinery since 1904*



CHICAGO STEEL SERVICE, Kildare Ave. and 45th St., Chicago 32, Ill., as distributor.

EARL J. PHILLIPS has been named district manager of the Chicago, Ill., sales office recently opened at 1927 N. Harlem Ave., of Sterling Electric Motors Corporation, Los Angeles, Calif.

UNITED STATES DIAMOND WHEEL Co., manufacturer of diamond grinding wheels, recently completed construction of its Aurora, Ill., plant, at 835 Illinois Ave.

REVCOR, manufacturer of blower wheels, recently moved from Chicago, Ill., to Carpentersville, Ill.

## Michigan and Wisconsin

JOHN MESTREZAT was recently appointed a vice-president by the J. N. Fauver Co., Inc., Detroit, Mich. Mr. Mestrezat, who has been with the company since 1944, was formerly a senior sales engineer, and he will continue to cover Flint and Upper Michigan.

GAIRING TOOL Co., Detroit, Mich., has acquired the line of interchangeable spade drills and core drills formerly made by the Conner Tool & Cutter Co., of Detroit, Mich., and Sullivan, Ind. All operations have been moved to the Gairing plant.

JAMES ENGINEERING & MACHINERY Co., 19741 James Couzens Highway, Detroit 35, Mich., will represent the V & O PRESS Co., DIVISION OF EMHART MFG. Co., Hudson, N. Y., in the Detroit area.

JACK L. MODRICH has joined Mechanical Air Controls, Inc., Detroit, Mich., in the capacity of general sales manager, while EDWARD L. RODGERS has come to the company as chief engineer.

SATULLO Co., 7635 E. Jefferson Ave., Detroit, Mich., has been appointed representative by G. C. WILSON & Co., Chatham, N. J., manufacturers of electronic timers.

RICHARD H. BERGE, assistant plant manager of the Pump Division of the Eaton Mfg. Co., Marshall, Mich., has been promoted to the position of plant manager.

MEYER ENGINEERING Co., announces the removal of its offices and plant to 19229 Mt. Elliott Ave., Detroit 34, Mich.

THEODORE F. ESERKALN has joined the Kempsmith Machine Co., Milwaukee, Wis., milling machine manufacturer, in the capacity of chief engineer. Mr. Eserkaln, who has long been associated with the design of



Theodore F. Eserkaln, chief engineer at the Kempsmith Machine Co.

milling machines, will direct an accelerated program of engineering development. Prior to this new association, he was director of engineering at the George Gorton Machine Co.

POOLE FOUNDRY & MACHINE Co., Woodberry, Baltimore, Md., announces the appointment of the KRAMER INDUSTRIAL SALES Co., Milwaukee, Wis., as representative for Poole flexible shaft couplings in Wisconsin and eastern Iowa.

PRECISION MACHINE Co., Milwaukee, Wis., gear manufacturer, announces the change of its corporate name to PRECISION GEARS, INC.

## New England

JACOBS MFG. Co., West Hartford, Conn., manufacturer of Jacobs chucks, has been acquired by the CHICAGO PNEUMATIC TOOL Co., New York City. Manufacturing and sales operations of the West Hartford concern will not be affected by the sale, and will be carried on without change by a new wholly-owned subsidiary of the Chicago Pneumatic Tool Co., to be known as the Jacobs Mfg. Co. (a New Jersey corporation). Directors and officers of the new Jacobs subsidiary are: GUY J. COFFEY, chairman of the board; HUBERT M. TOPPIN, vice-chairman of the board; LOUIS B. STONER, president and a director; ARTHUR M. STONER, vice-president—engineering, and a director; ALBERT E. ENGLUND, vice-president—manufacturing, and a director; ROBERT M. TOPPIN, director and factory manager; and SAMUEL B. CONANT, director and sales manager.

HARRY W. HOLDSWORTH has been made advertising manager of the

New Departure Division of General Motors Corporation, Bristol, Conn. He succeeds CARLETON B. BECKWITH, who recently retired after forty years of service with New Departure. Mr. Holdsworth has been with the Division since 1920.

DAVID J. RYFFEL has joined the Producto Machine Co., Bridgeport, Conn., manufacturer of die sets and other stamping equipment, as advertising manager. Mr. Ryffel will be responsible for all advertising and public relations work.

AMERICAN CAM Co., Hartford, Conn., has completed its transfer to new quarters at Bloomfield, Conn., but will retain its previous mailing address—Hartford 1, Conn.

NORTON Co., Worcester, Mass., announces the following sales appointments: ALLEN C. MOORE, formerly in the sales engineering department of the Detroit, Mich., office, has been named abrasive engineer in the western Michigan area, assuming the duties of STEWART J. BELL, who is retiring after almost forty years of service with the company; HARLAN W. COBB, Cleveland, Ohio, office manager, has become a field engineer in the Cleveland area; PHILIP H. THRESHIE, formerly a West Coast field engineer, has been appointed an abrasive engineer in San Diego, Calif., and Arizona; and ROBERT P. COOPER and ROBERT N. HAMILTON, field engineers, have been assigned to the Los Angeles, Calif., area.

VAN NORMAN Co., Springfield, Mass., announces the promotion of the following executives: ROGER L. PYNE, vice-president, who has been in charge of all activities within the Machine Tool Division, will henceforth concentrate on the engineering phases of that field; HERBERT L. FREER, production planning manager will become general sales manager in the Machine Tool Division; EDWARD C. HELLYER, production planning superintendent, will fill the vacancy of production planning manager; and GEORGE A. RAICHE, public relations director, will hold the position of advertising manager in addition to his present work.

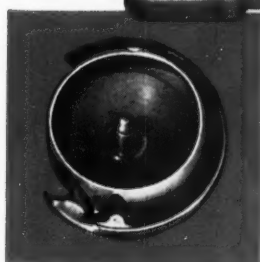
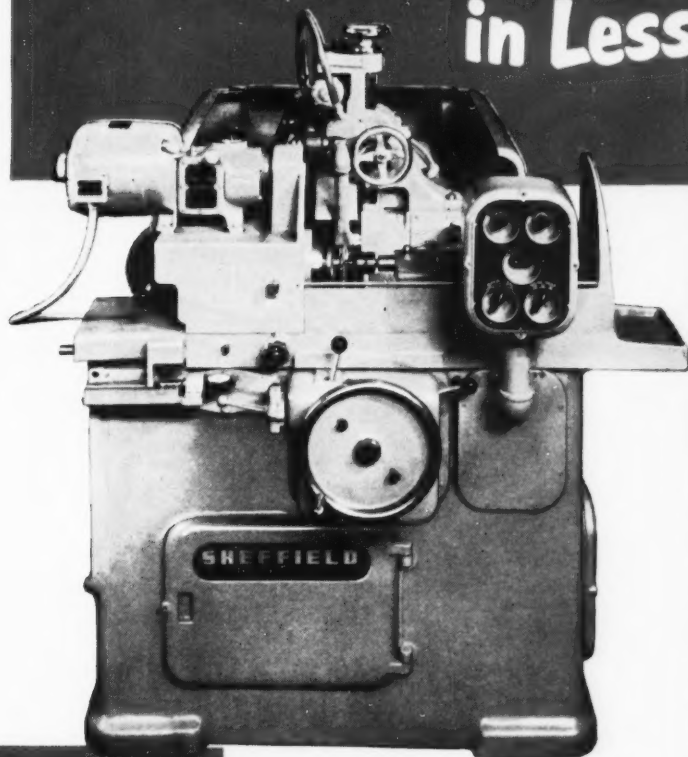
GEORGE A. BURKE, has joined the Boston Gear Works, Quincy, Mass., to serve as advertising manager. He was formerly assistant editor of *Modern Materials Handling*.

NICHOLAS D. VUYOSEVICH has been appointed manager of the newly acquired Hi-Pac Division of the Worcester Pressed Steel Co., Worcester, Mass.

ROBERT S. SAGERS has been named manager of the New England district by Kennametal, Inc., Latrobe,

(Continued on page 251)

# Savings amortize this CRUSHTRUE GRINDER in Less than a Year



To finish this sewing machine bobbin, both faces and O.D. of the flange are ground and outer corners chamfered. Formerly it required five men and five different machines to turn out 68 pieces per hour.

Now, one Sheffield Thread and Form Grinder, performs all five operations simultaneously—one machine with one operator instead of five machines with five operators.

And production is 85 pieces per hour instead of 68—a 27% increase. The first 12 months' savings in direct labor were more than enough to pay for the Crushtrue Grinder.

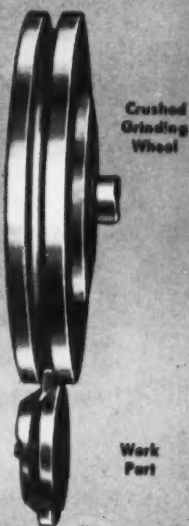
Simple forms and threads—and profiles so difficult as to be considered almost impossible to reproduce otherwise—can be Crushtrue ground with savings as much as 70%.

Ask to see the automatic sound slide films on Crushtrue grinding—they can be shown in your office.



Crushtrue Roll

Crushed Grinding Wheel



Crushed Grinding Wheel

Work Part

6289



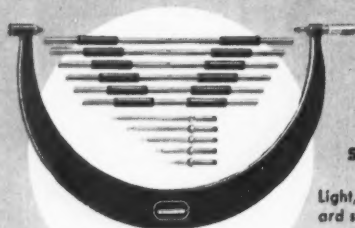
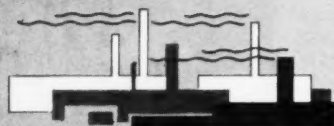
the **Sheffield** CORPORATION  
DAYTON 1, OHIO, U.S.A.

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In Australia, the Sheffield Corporation of Australia Pty. Ltd., Melbourne

All the skill in the world can't put precision into a product without accurate measuring tools. See that your men check their work with Starrett Tools and you will avoid a major source of loss at final inspection.

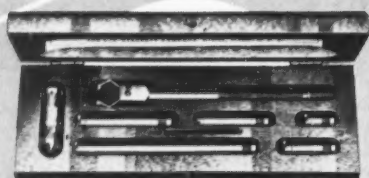
## FOR PRECISION IN PRODUCTION



No. 724

**Starrett Tubular Micrometer  
No. 724**

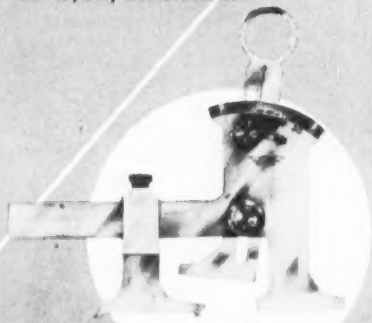
Light, sensitive and easy to handle. Standard sizes from 12" to 60" — up to 168" on special order. Bow and bar types with fixed, sliding or interchangeable anvils. Also with dial indicator heads on special order.



No. 823

**Starrett Inside Micrometer  
No. 823**

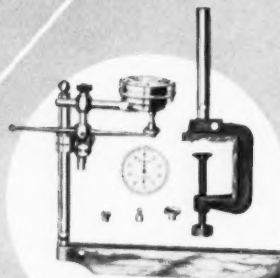
With tubular rods, quick-reading micrometer head, hardened and ground contact surfaces, no-glare Satin Chrome Finish. Available in 1 1/2 to 8" or 1 1/2 to 12" capacities. No. 124 with solid rods up to 32" capacity also available.



No. 459

**Starrett Cutter Clearance Gage  
No. 459**

Checks clearance on end, side, spiral, helix and inserted-tooth cutters from 1/2" diameter up — without removing cutter from arbor. Use it to prolong cutter life, improve production, save grinding time, reduce costs.



No. 196-A

**Starrett Universal Dial Test Indicator  
No. 196-A**

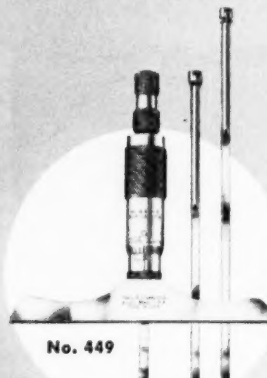
Easy to set up, read and use. Standard attachments provide for universal application on lathe tool posts, surface gage spindles, lathe and planer tools, arbors, etc. Graduated .001", reads 0-100, range .200". Also available to read 0-50-0, 0-20-0 and 0-40.



No. 831

**Starrett Small Hole Gages  
No. 831**

Quick adjusting, sensitive, with flat contacts plus long handles for gaging deep or shallow holes, slots, etc. Four gages cover the range 1/8" to 1/2".



No. 449

**Starrett Micrometer Depth Gages  
No. 449**

Flat rods can be turned to any angle, won't roll off narrow shoulders. Has 1-inch movement, Satin Chrome Finish, range 0-3 or 0-6 inches, choice of 2 1/2 or 4 inch base.



TRADE MARK  
**Starrett**  
REG U.S. PAT OFF

SINCE 1880  
WORLD'S GREATEST TOOLMAKERS



**THE L. S. STARRETT COMPANY**  
Athol, Massachusetts, U. S. A.

MECHANICS' HAND MEASURING TOOLS AND PRECISION INSTRUMENTS  
DIAL INDICATORS • STEEL TAPES • PRECISION GROUND FLAT STOCK  
HACKSAWS, BAND SAWS and BAND KNIVES

Buy  
THROUGH YOUR  
**INDUSTRIAL  
DISTRIBUTOR**

Prompt delivery  
Dependable service  
Quality products

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# MACHINERY'S DATA SHEETS 737 and 738

## SAE STANDARD SIZES OF SLEEVE TYPE HALF-BEARINGS — 1

| Nominal Shaft Diameter, Inches | Light Series         |                                |                    |                                      | Heavy Series         |                                |                    |                                    |
|--------------------------------|----------------------|--------------------------------|--------------------|--------------------------------------|----------------------|--------------------------------|--------------------|------------------------------------|
|                                | Wall Thickness, Inch | Wall Tolerance, Inch (-0.0000) |                    | Housing Bore, Inches -0.0000 +0.0005 | Wall Thickness, Inch | Wall Tolerance, Inch (-0.0000) |                    | Housing Bore, Inches -0.000 +0.001 |
|                                |                      | Standard Bimetal               | Overplated Bimetal |                                      |                      | Standard Bimetal               | Overplated Bimetal |                                    |
| 3/4                            | 0.0625               | +0.0003                        | +0.0005            | 0.8745                               |                      |                                |                    |                                    |
| 13/16                          | 0.0625               | +0.0003                        | +0.0005            | 0.9370                               |                      |                                |                    |                                    |
| 7/8                            | 0.0625               | +0.0003                        | +0.0005            | 0.9995                               |                      |                                |                    |                                    |
| 15/16                          | 0.0625               | +0.0003                        | +0.0005            | 1.0620                               |                      |                                |                    |                                    |
| 1                              | 0.0625               | +0.0003                        | +0.0005            | 1.1245                               |                      |                                |                    |                                    |
| 1 1/16                         | 0.0625               | +0.0003                        | +0.0005            | 1.1870                               |                      |                                |                    |                                    |
| 1 1/8                          | 0.0625               | +0.0003                        | +0.0005            | 1.2495                               |                      |                                |                    |                                    |
| 1 3/16                         | 0.0625               | +0.0003                        | +0.0005            | 1.3120                               |                      |                                |                    |                                    |
| 1 1/4                          | 0.0625               | +0.0003                        | +0.0005            | 1.3745                               |                      |                                |                    |                                    |
| 1 5/16                         | 0.0625               | +0.0003                        | +0.0005            | 1.4370                               |                      |                                |                    |                                    |
| 1 3/8                          | 0.0625               | +0.0003                        | +0.0005            | 1.4995                               |                      |                                |                    |                                    |
| 1 7/16                         | 0.0625               | +0.0003                        | +0.0005            | 1.5620                               |                      |                                |                    |                                    |
| 1 1/2                          | 0.0625               | +0.0003                        | +0.0005            | 1.6245                               | 0.075                | +0.0003                        | +0.0005            | 1.651                              |
| 1 9/16                         | 0.0625               | +0.0003                        | +0.0005            | 1.6870                               |                      |                                |                    |                                    |
| 1 5/8                          | 0.0625               | +0.0003                        | +0.0005            | 1.7495                               | 0.075                | +0.0003                        | +0.0005            | 1.776                              |
| 1 11/16                        | 0.0625               | +0.0003                        | +0.0005            | 1.8120                               |                      |                                |                    |                                    |
| 1 3/4                          | 0.0625               | +0.0003                        | +0.0005            | 1.8745                               | 0.075                | +0.0003                        | +0.0005            | 1.901                              |
| 1 13/16                        | 0.0625               | +0.0003                        | +0.0005            | 1.9370                               |                      |                                |                    |                                    |
| 1 7/8                          | 0.0625               | +0.0003                        | +0.0005            | 1.9995                               | 0.075                | +0.0003                        | +0.0005            | 2.026                              |
| 1 15/16                        | 0.0625               | +0.0003                        | +0.0005            | 2.0620                               |                      |                                |                    |                                    |
| 2                              | 0.0625               | +0.0003                        | +0.0005            | 2.1245                               | 0.075                | +0.0003                        | +0.0005            | 2.151                              |
| 2 1/16                         | 0.0625               | +0.0003                        | +0.0005            | 2.1870                               |                      |                                |                    |                                    |
| 2 1/8                          | 0.0625               | +0.0003                        | +0.0005            | 2.2495                               | 0.075                | +0.0003                        | +0.0005            | 2.276                              |
| 2 3/16                         | 0.0625               | +0.0003                        | +0.0005            | 2.3120                               |                      |                                |                    |                                    |
| 2 1/4                          | 0.0625               | +0.0003                        | +0.0005            | 2.3745                               | 0.075                | +0.0003                        | +0.0005            | 2.401                              |
| 2 5/16                         | 0.0625               | +0.0003                        | +0.0005            | 2.4370                               |                      |                                |                    |                                    |
| 2 3/8                          | 0.0625               | +0.0003                        | +0.0005            | 2.4995                               | 0.075                | +0.0003                        | +0.0005            | 2.526                              |
| 2 7/16                         | 0.0625               | +0.0003                        | +0.0005            | 2.5620                               |                      |                                |                    |                                    |

MACHINERY'S Data Sheet No. 737, September, 1953

Based on Report of Engine Technical Committee of SAE

## SAE STANDARD SIZES OF SLEEVE TYPE HALF-BEARINGS — 2

| Nominal Shaft Diameter, Inches   | Light Series         |                                |                    |                                      | Heavy Series         |                                |                    |                                    |
|--|----------------------|--------------------------------|--------------------|--------------------------------------|----------------------|--------------------------------|--------------------|------------------------------------|
|  | Wall Thickness, Inch | Wall Tolerance, Inch (-0.0000) |                    | Housing Bore, Inches -0.0000 +0.0005 | Wall Thickness, Inch | Wall Tolerance, Inch (-0.0000) |                    | Housing Bore, Inches -0.000 +0.001 |
|  |                      | Standard Bimetal               | Overplated Bimetal |                                      |                      | Standard Bimetal               | Overplated Bimetal |                                    |
| 2 1/2  | 0.075                | +0.0003                        | +0.0005            | 2.6505                               | 0.095                | +0.0003                        | +0.0005            | 2.691                              |
| 2 9/16   | 0.075                | +0.0003                        | +0.0005            | 2.7130                               |                      |                                |                    |                                    |
| 2 5/8  | 0.075                | +0.0003                        | +0.0005            | 2.7755                               | 0.095                | +0.0003                        | +0.0005            | 2.816                              |
| 2 11/16  | 0.075                | +0.0003                        | +0.0005            | 2.8380                               |                      |                                |                    |                                    |
| 2 3/4  | 0.075                | +0.0003                        | +0.0005            | 2.9005                               | 0.095                | +0.0003                        | +0.0005            | 2.941                              |
| 2 13/16  | 0.075                | +0.0003                        | +0.0005            | 2.9630                               |                      |                                |                    |                                    |
| 2 7/8  | 0.075                | +0.0003                        | +0.0005            | 3.0255                               | 0.095                | +0.0003                        | +0.0005            | 3.066                              |
| 2 15/16  | 0.075                | +0.0003                        | +0.0005            | 3.0880                               |                      |                                |                    |                                    |
| 3  | 0.075                | +0.0003                        | +0.0005            | 3.1505                               | 0.095                | +0.0003                        | +0.0005            | 3.191                              |
| 3 1/8  | 0.075                | +0.0003                        | +0.0005            | 3.2755                               |                      |                                |                    |                                    |
| (Note different housing bore tolerances for shaft diameters above 3 1/8 inches.) |                      |                                |                    | -0.0000 +0.0010                      |                      |                                |                    |                                    |
| 3 1/4  | 0.095                | +0.0003                        | +0.0005            | 3.4415                               | 0.125                | +0.0003                        | +0.0005            | 3.502                              |
| 3 3/8  | 0.095                | +0.0003                        | +0.0005            | 3.5665                               |                      |                                |                    |                                    |
| 3 1/2  | 0.095                | +0.0003                        | +0.0005            | 3.6915                               | 0.125                | +0.0003                        | +0.0005            | 3.752                              |
| 3 5/8  | 0.095                | +0.0003                        | +0.0005            | 3.8165                               |                      |                                |                    |                                    |
| 3 3/4  | 0.095                | +0.0003                        | +0.0005            | 3.9420                               | 0.125                | +0.0003                        | +0.0005            | 4.002                              |
| 3 7/8  | 0.095                | +0.0003                        | +0.0005            | 4.0670                               |                      |                                |                    |                                    |
| 4  | 0.095                | +0.0005                        | +0.0007            | 4.1920                               | 0.125                | +0.0005                        | +0.0007            | 4.252                              |
| 4 1/8  | 0.095                | +0.0005                        | +0.0007            | 4.3170                               |                      |                                |                    |                                    |
| 4 1/4  | 0.125                | +0.0005                        | +0.0007            | 4.5020                               | 0.155                | +0.0005                        | +0.0007            | 4.562                              |
| 4 3/8  | 0.125                | +0.0005                        | +0.0007            | 4.6270                               |                      |                                |                    |                                    |
| 4 1/2  | 0.125                | +0.0005                        | +0.0007            | 4.7520                               | 0.155                | +0.0005                        | +0.0007            | 4.812                              |
| 4 5/8  | 0.125                | +0.0005                        | +0.0007            | 4.8770                               |                      |                                |                    |                                    |
| 4 3/4  | 0.125                | +0.0005                        | +0.0007            | 5.0020                               | 0.155                | +0.0005                        | +0.0007            | 5.062                              |
| 4 7/8  | 0.125                | +0.0005                        | +0.0007            | 5.1270                               |                      |                                |                    |                                    |
| 5  | 0.125                | +0.0005                        | +0.0007            | 5.2520                               | 0.155                | +0.0005                        | +0.0007            | 5.312                              |

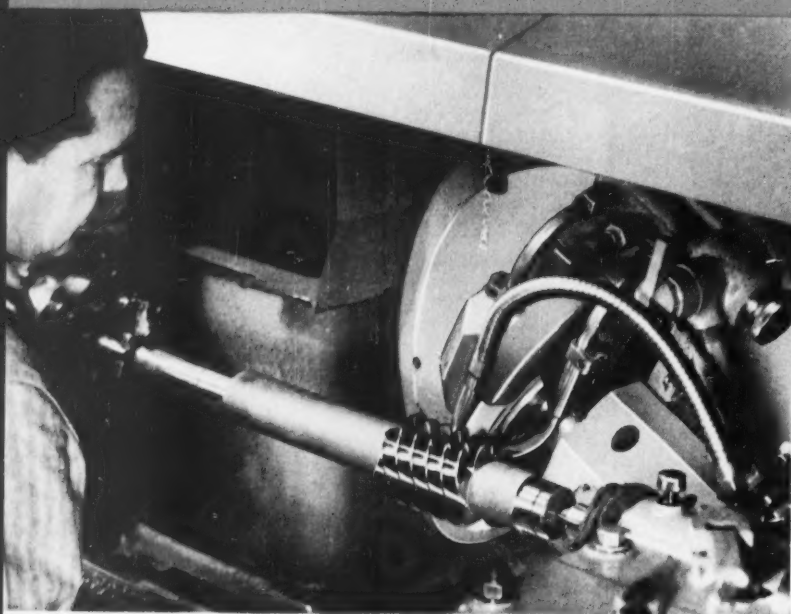
MACHINERY'S Data Sheet No. 738, September, 1953

Based on Report of Engine Technical Committee of SAE



# Grinding 5-Start Worm with 4" Lead

## STANDARD STYLE 36 EX-CELL-O Precision THREAD GRINDER

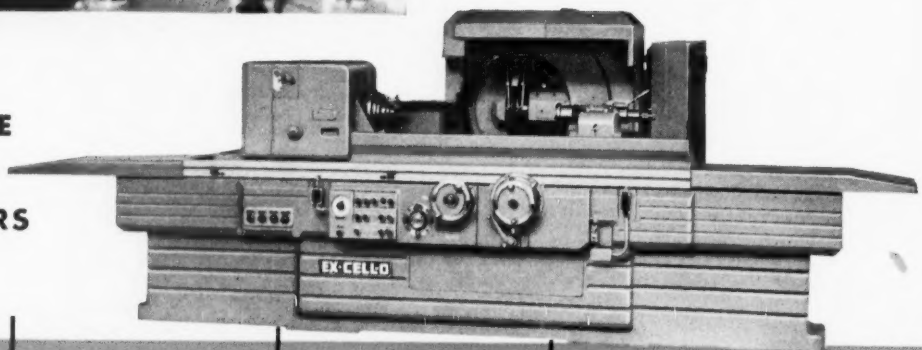


In the photograph at the left the operator is grinding a worm shaft for use in a special machine. The part is about 22" long and the worm is 4½" long, 3.430" O.D., has 5 starts, a pitch of .800", a lead of 4" and a tooth depth of .5454". The worm was ground in two operations on a standard Style 36 Thread Grinder. It was rough ground from the solid, hardened, then finish ground.

For complete information and specifications on the Style 36 and other Ex-Cell-O Thread Grinders contact your local representative or write today to Ex-Cell-O.



### A COMPLETE LINE OF PRECISION THREAD GRINDERS



**STYLE 30**  
Precision Thread Grinder—a versatile machine for external work, also available with internal attachment.

**STYLE 33**  
Precision Thread Grinder—a high production machine for external work.

**STYLE 39-A**  
Precision Thread Grinder—a high production machine for internal threads.

**STYLE 36**  
Precision Thread Grinder—a versatile machine for extra long external threads, available with internal attachment.

## EX-CELL-O CORPORATION • Detroit 32, Michigan

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING SPINDLES • CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

Pa. Mr. Sagers was formerly service and sales representative in the company's Middle Atlantic district.

## New York and New Jersey

REVERE COPPER & BRASS INC., New York City, announces the formation of a new aluminum general sales department. STANLEY H. WILSON, formerly sales manager of the company's Aluminum Division in Baltimore, Md., has been appointed aluminum sales manager, while HAROLD C. WILSON, who was his assistant, has also been transferred to New York City as assistant aluminum sales manager. EDWARD S. BUNN, formerly metallurgical manager of the Aluminum Division, has been assigned to the general manufacturing department in New York City.

ROGER E. VAUGHAN, executive vice-president of the Consolidated Machine Tool Corporation, Rochester, N. Y., subsidiary of Farrel-Birmingham Co., Inc., has been elected a member of the board of directors. Mr. Vaughan, who was formerly assistant general manager of the Farrel-Birmingham plant at Buffalo, N. Y., was appointed assistant general manager of the Consolidated Machine Tool plant the beginning of this year, and in April was elected executive vice-president.

ROBERT L. HOLLOWAY has been named chief engineer in the Buffalo, N. Y., plant of the American Machine & Foundry Co., New York City, succeeding RUSSELL G. ZUEFLE, who has resigned. Mr. Holloway was formerly manager of the special projects and development section in the Buffalo engineering department.

PARKS & GREEN Co., 396 Broadway, New York City, is a newly organized concern specializing in the sale of screw machine and production tooling, and also representing the EMPIRE TOOL Co., Detroit, Mich., in metropolitan New York.

ROBERT C. HANNA has been named manager of marketing of the newly established marketing department in the Component Products Division of the General Electric Co., Schenectady, N. Y. Mr. Hanna has been with the company since 1929.

FRED A. MILNES has joined the staff of the Morey Machinery Co., Inc., New York City, where he will head the enlarged division of presses and other machinery. Mr. Milnes was formerly associated with the E. W. Bliss Co.

ROBERT C. BRADY has been made New York City office manager of the Farrel-Birmingham Co., Inc., Ansonia, Conn., succeeding CARL TER WEELE, who has resigned.

KURT ORBAN Co., INC., New York City, has been appointed American distributor for the complete line of German-made Wafios wire forming, wire netting, spring making, and nail making machinery.

EDWARD P. SMITH has been named a sales engineer in Manhattan and Long Island by the Wales-Strippit Corporation, North Tonawanda, N. Y., machine tool manufacturer.

W. W. KERLIN has been named manager of service engineers for the Meehanite Metal Corporation, New Rochelle, N. Y.

ARVIN W. HARRINGTON has been named sales representative in metropolitan New York and Connecticut for the Alloy Tube Division of the Carpenter Steel Co., Union, N. J.

## Ohio

AMERICAN STEEL AND WIRE DIVISION OF THE UNITED STATES STEEL CORPORATION, Cleveland, Ohio, announces that its Spring Products Sales Division will be combined with the Manufacturers Products Sales Division and will be headed by CHARLES W. MEYERS. EDMOND J. WALSH will be assistant manager of the division in charge of rods, wire, and cold-rolled strip. ROBERT D. KNIGHT will be assistant manager in charge of springs.

W. M. TRUSKA, JR., was recently appointed European sales representative by the Hydraulic Press Mfg. Co., Mount Gilead, Ohio. He will be located at the company's new manufacturing center in the Netherlands, Hydraulische Pers Maatschappij Nederland, N. V., the headquarters of which are at 558 Keizersgracht,



W. M. Truska, Jr., newly appointed European sales representative of Hydraulic Press Mfg. Co.

Amsterdam. The center will produce the company's full line of presses for distribution in Western Europe and other territories, coordinating sales and service as well. Officers of this wholly-owned company subsidiary are: G. B. ROBINSON, chairman of the board; JOHN C. COTNER, president; and JOHN M. DOLAN, vice-president.

J. P. ARNDT, JR., formerly manager of the crystal sales department at the Brush Electronics Co., Cleveland, Ohio, has been appointed assistant general sales manager. He succeeds A. J. W. NOVAK, who was assistant general sales manager for operations, but is now in a new post as head of all line sales activities, including the equipment, tape recorder, component, and international departments.

AEROQUIP CORPORATION, Jackson, Mich., producer of flexible hose lines, has purchased the Sterling Electric Motors plant in Van Wert, Ohio. DON T. MCKONE, JR., will become general manager of the Van Wert plant. He was formerly assistant general manager at the Aero-Coupling Corporation, West Coast subsidiary of Aeroquip Corporation.

E. J. VARGO has been appointed assistant production manager of the Wellman Bronze & Aluminum Co., Cleveland, Ohio. Mr. Vargo has been with the company for eleven years, most recently having been works manager at the Ebaloy Foundries in Rockford, Ill.

RELiance ELECTRIC & ENGINEERING Co., Cleveland, Ohio, announces the appointments of the following engineers: DONALD L. PETERSON, Cleveland, Ohio, district sales office; DAVID H. RUSH, Buffalo, N. Y., office; and JOHN E. HARGER, Detroit, Mich., office.

RICHARD M. WEST, formerly assistant advertising and sales promotion manager of the Osborn Mfg. Co., Cleveland, Ohio, has been promoted to the post of advertising manager. Mr. West joined the Osborn sales department ten years ago.

CYRIL BATH Co., Cleveland, Ohio, recently moved to its plant located on Aurora Road, Solon, Ohio. The new structure comprises 50,000 square feet, occupying one-fourth of the 18 acres purchased.

FRANKLIN R. HOADLEY, JR., a sales engineer for the Farrel-Birmingham Co., Inc., has been transferred from the company's main office at Ansonia, Conn., to the Akron, Ohio, branch office.

FRANK S. SCHINDLER has joined Fluid Controls, Inc., Mentor, Ohio, filling the post of assistant chief engineer.

## Pennsylvania

KENNAMETAL INC., Latrobe, Pa., announces the following appointments: ROBERT P. SCHWING and EDWARD R. WILLERTON, representatives, and WILLIAM H. HILTEBEITEL and SAMUEL H. JONES, service engineers, in the Middle Atlantic district, with headquarters at 3701 N. Broad St., Philadelphia, Pa.; LOUIS LEKICH, service engineer in the Central District branch, 5531 Woodward Ave., Detroit, Mich.; and RICHARD W. PHELPS, service engineer in the Milwaukee district, 744 N. Fourth St., Milwaukee, Wis.

I. MELVILLE STEIN has been elected president of the Leeds & Northrup Co., Philadelphia, Pa., succeeding CHARLES S. REDDING who, after fourteen years as president, becomes chairman of the board. Mr. Stein, who has been with the company since 1919, was formerly executive vice-president, and this position will be filled by D. H. SCHULTZ, who was secretary and treasurer of the company. Mr. Schultz will retain his duties of treasurer, while GEORGE W. TALL, JR., vice-president, assumes the additional post of secretary.

FEDERAL PRODUCTS CORPORATION, Providence, R. I., recently opened a branch sales office to serve eastern Pennsylvania, southern New Jersey, Delaware, and Maryland. The office is located at the Colonial Bldg., Wayne, Pa., and will be under the management of JOHN E. LAFFEY. He will be assisted by FRANK PARDEE. Mr. Lafeey was formerly a sales engineer in the Indianapolis, Ind., office, while Mr. Pardee was in the sales engineering department in Providence.

PRUDENTIAL INDUSTRIES INC., Doylestown, Pa., which previously specialized in textile products, has been reorganized and will enter the field of manufacturing precision metal parts for the electronics, aviation, and other industries. Two companies—ATLAS CHAIN & MFG. CO. and ATLAS METAL STAMPING CO. of Philadelphia—will be consolidated with and become divisions of Prudential Industries Inc. The Atlas Metal Stamping Co. will be known in the future as the ATLAS PRECISION PRODUCTS CO.

LANDIS MACHINE CO., Waynesboro, Pa., announces the removal of its Chicago and Cleveland offices to the following locations: the Chicago office, under the supervision of PAUL A. REYNOLDS, district manager, is now at 6920 W. North Ave., Chicago 35, Ill.; and the Cleveland office, under the supervision of E. O. PEIFFER, at 13967 Cedar Road, Cleveland 18, Ohio.

WALLACE M. KUNKEL and ROSS C. STEVENS recently joined De Walt

Inc., Lancaster, Pa., subsidiary of the American Machine & Foundry Co., being made district sales managers. Mr. Kunkel's territory will be northern New Jersey, while Mr. Stevens's territory will be Connecticut, and Westchester and Putnam Counties in New York State.

IPSEN INDUSTRIES, INC., Rockford, Ill., manufacturers of automatic heat-treating equipment, are opening a sales and service office at 3400 Tudor St., Philadelphia, Pa. MRS. MARGARET SCHRAMM will be manager; ALFRED E. STONE, sales engineer; and JOHN KEEGAN, service engineer.

LUKENS STEEL CO., Coatesville, Pa., has announced plans to build a \$10,500,000 armor plate producing plant adjacent to the present heat-treating plant. Authority for this building has been received from the United States Department of the Navy, Bureau of Ships.

BARWOOD & Co., 3137 N. 15th St., Philadelphia, Pa., was recently appointed representative in Baltimore, Md., Philadelphia, Pa., and Trenton, N. J., by the B. C. AMES Co., Waltham, Mass.

"VISUAL" PLANNING EQUIPMENT CO., INC., Oakmont, Pa., manufacturer of lay-out models and templates, announces that its corporate name has been changed to "VISUAL" PLANT LAYOUTS INC.

RAYMOND J. ZALE, steel metallurgist at Firth Sterling, Inc., Pittsburgh, Pa., has been promoted to the position of assistant to the sales manager, Steel Division.

G. LYNN COANE has joined the Baldwin-Lima-Hamilton Corporation, Philadelphia, Pa., in the post of sales engineer in the commercial weldment department.

## South Atlantic States

B. C. AMES Co., Waltham, Mass., has appointed TERRY, INC., 1426 M St. Northwest, Washington 5, D. C., representative for Ames micrometer dial gages and indicators. The representative will also offer an engineering service in Washington, western Maryland (except Baltimore), Virginia, and the eastern section of West Virginia.

GORDON S. LIGHT has been named staff engineer to the president of the Engineering & Research Corporation, Riverdale, Md.

DELUXE SAW & TOOL CO., a subsidiary of the Rockwell Mfg. Co., Pittsburgh, Pa., is transferring its headquarters and out-of-state manufacturing facilities from Chicago,

Ill., and Columbus, Ohio, to High Point, N. C. The company, which manufactures carbide-tipped circular saw blades and other tools, will maintain its plant location at 2476 Blue Island Ave., in Chicago as a service center and sales headquarters in the Middle West.

R. H. JACKSON has been named manager of sales for the southeastern district of the Apparatus Sales Division of the General Electric Co., Schenectady, N. Y. Headquarters for the district are at Atlanta, Ga. The following men will comprise the sales staff: J. H. PERSONS, manager of agency and distributor sales; M. O. TROY, JR., manager of apparatus product sales; B. D. CASEY, JR., manager of component product sales; and J. F. BAKER, manager of industry sales.

## Texas, Arkansas, and Alabama

V & O PRESS CO., DIVISION OF EMHART MFG. CO., Hudson, N. Y., announces the appointment of the BRIGGS-WEAVER MACHINERY CO., Box 5609, Dallas, Tex., to represent the company in Texas.

GENERAL ELECTRIC Co., Schenectady, N. Y., is beginning construction of a manufacturing plant on a 30-acre plot at Jonesboro, Ark., which will be part of the company's specialty fractional horsepower motor department, and will manufacture small blower and fan motors for refrigerators, air conditioners, and other equipment. Department headquarters will be at Fort Wayne, Ind.

McVOY-HAUSMAN Co., 2024 Sixth Ave. N., Birmingham, Ala., will represent the V & O PRESS CO., DIVISION OF EMHART MFG. CO., Hudson, N. Y., in Alabama.

## Canada and Alaska

LINK BELT Co., Chicago, Ill., recently opened a new plant for Link-Belt Ltd., at Scarboro, Ont., Canada. This plant will now become headquarters for the Canadian company. Steel fabrication and the heavier assembly work have also been moved to this plant, thus increasing capacity at the Toronto plant for producing conveyor and power transmission components.

NORTHERN COMMERCIAL Co., has become the first Alaskan agent and distributor for apparatus products of the General Electric Co., Schenectady, N. Y. VOLNEY RICHMOND, JR., is president and general manager of the company, which will provide service in Juneau, Ketchikan, Anchorage, Fairbanks, and Nome.



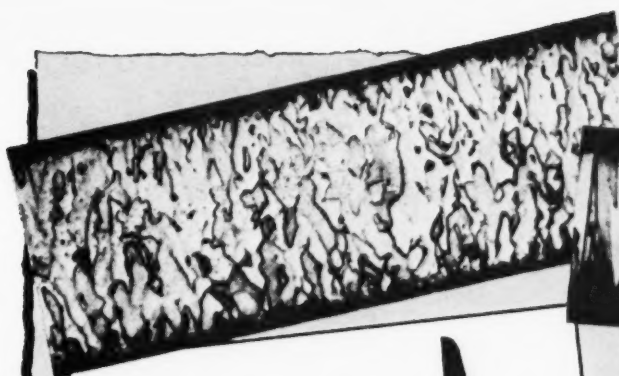


Fig. 1. Photomicrograph of sheet with large irregular grains. Printing quality not up to par.



Fig. 2. Changes in plating conditions produced crystals more columnar in shape. A step in the right direction.

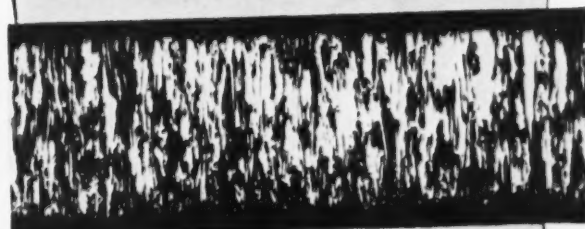


Fig. 3. Here is the structure that was found to give consistently good results. The copper deposit is of intermediate hardness and contains long, thin columnar crystals.

# research at work!

**A LABORATORY CAN SHORTEN THE  
SEARCH FOR A BETTER PROCESS**

Copper, a basic and important requisite for the printing of Sunday magazines for metropolitan newspapers, has—since the introduction of rotogravure printing process in the United States—suffered from cylinder wear marks which have kept the industry puzzled, and often resulted in defective printing to such an extent that blemishes in printing were easily discernible to the eye—and although not too disfiguring, there remained the necessity for their elimination for the purpose of perfecting the gravure printing operation. In collaboration with a publisher, owner of one of the most modern plants in the world, Revere Copper and Brass solved this perplexing problem and is continuing to contribute to the technical improvement of the rotogravure printing process.

In preparing cylinders for printing roto sections, copper is plated on them before engraving. The electroplating of copper is rather an old process, and its techniques are well understood. By varying current density and composition of the solution, many different types of copper deposit can be obtained. But which of the various methods would give the best results in this case? Rather than engage in a lengthy process of trial and error, the publisher, who felt that the crystal structure of the deposited copper held the key, asked us if we would collaborate.

## What Were the Crystals Like?

Sheets of copper resulting from different plating techniques were sent to Research, which not only made photomicrographs of the grain structure, but also determined tensile strength and hardness. As was expected, there were large variations. Some specimens had large and irregular crystals; in others, they were long and thin, like fibers standing on end. In tensile strength, the range was from about 31,000 to 56,000 p.s.i. Diamond Pyramid hardness numbers ran from 62.9 to 141.5.

Over a period of time five different sets of samples were submitted to the laboratory, which made detailed reports on each. By correlating these with his own records, the

publisher was able to evaluate the effects of changes in plating techniques. The field of his investigation became narrower after each laboratory report, and in the end it was possible for him to obtain medium-hard, fine grain deposits which require little grinding and polishing. These results now are duplicated daily on a commercial basis. Today the publisher is noted for the exceptionally fine printing quality of his rotogravure sections. The newspaper is The Inquirer, Philadelphia, Pa.

## If You Do Not Have a Laboratory

This is an outstanding example of the value of applied research. Many companies occasionally need information that can only be supplied by a laboratory, but are not justified in spending the large sums required to buy and maintain scientific equipment, and to employ qualified research personnel. These firms naturally seek outside sources of the data they require. Revere was glad to cooperate in this instance, because it produces large quantities of copper anodes for plating, and has both the equipment and the experience to make thorough tests of electro-deposited copper sheets or layers.

\* \* \*

The Revere Research Department operates a laboratory that contains the latest scientific equipment, including the spectrograph and X-ray diffraction apparatus. If you feel the need of laboratory work on copper and its alloys, or aluminum alloys, please get in touch with the nearest Revere Sales Office.

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## Obituaries

ELLWOOD C. HOWELL, advertising and sales promotion manager for the Carboloy Department of General Electric Co., Detroit, Mich., died of a heart attack on August 13. Mr. Howell became associated with the Carboloy Co., Inc., (now the Carboloy Department of General Electric Co.) in 1930 in the capacity of advertising manager, the post he held for twenty-four years. He was a member of numerous professional organizations. Mr. Howell is survived by his wife and two sons.

L. M. KLINEDINST, a former vice-president and director of the Timken Roller Bearing Co., Canton, Ohio, died on August 10 of a heart ailment. Mr. Klinedinst started with the company in 1905, and rose to the position of vice-president in charge of sales, which position he held when he retired in 1948.

CLIFFORD J. WETMORE, general manager of Kennametal Tools & Mfg. Co., Ltd., Hamilton, Ontario, Canada, died on July 19.

## Coming Events

SEPTEMBER 4-13—THIRD EUROPEAN MACHINE TOOL EXPOSITION in Brussels, Belgium, sponsored by the Belgium Society of Machine Tools for Metal-Working. Further information can be obtained from the general manager of the Exposition, Pol Raskin, 21, rue des Drapiers, Brussels, Belgium.

SEPTEMBER 21-25—Exposition of the INSTRUMENT SOCIETY OF AMERICA, at the Sherman Hotel, Chicago, Ill. Further information can be obtained from the Society, 1319 Allegheny Ave., Pittsburgh, Pa.

OCTOBER 1-2—Third annual meeting of the NATIONAL ASSOCIATION OF ALUMINUM DISTRIBUTORS at the Broadmoor, Colorado Springs, Colo., Secretary, R. Bruce Wall, 1900 Arch St., Philadelphia 3, Pa.

OCTOBER 5-7—Fall meeting of the AMERICAN SOCIETY OF MECHANICAL ENGINEERS at the Hotel Sheraton, Rochester, N. Y. Secretary, C. E. Davies, 29 W. 39th St., New York 18, N. Y.

OCTOBER 6-7—First Fall meeting of the NATIONAL FLUID POWER ASSOCIATION at the Sheraton Hotel, Chicago, Ill. Executive secretary, Barrett Rogers, 1618 Orrington Ave., Evanston, Ill.

OCTOBER 8-9—Eighth Midwest Conference of the AMERICAN SOCIETY

FOR QUALITY CONTROL, to be held in the Masonic Temple at Davenport, Iowa. For further information write to Jack E. Meyers, International Harvester Co., Farmall Works, Rock Island, Ill.

OCTOBER 14-16—Sixth Annual Conference on Machine Tools sponsored by the Sub-Committee on Machine Tools of the AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS, to be held at the Cleveland Hotel, Cleveland, Ohio. General Sub-Committee Chairman, R. H. CLARK, Warner & Swasey Co., Cleveland 6, Ohio.

OCTOBER 19-23—Thirty-fifth National Metal Exposition and Congress of the AMERICAN SOCIETY FOR METALS to be held at the Cleveland Public Auditorium, Cleveland, Ohio. Secretary, W. H. Eisenman, 7301 Euclid Ave., Cleveland 3, Ohio.

OCTOBER 25-28—Semi-annual meeting of the AMERICAN GEAR MANUFACTURERS ASSOCIATION, to be held at Edgewater Beach Hotel, Chicago, Ill. John C. Sears, executive secretary, Empire Bldg., Pittsburgh, 22, Pa.

NOVEMBER 9-13—MONTREAL TOOL AND INDUSTRIAL EQUIPMENT SHOW, associated with Montreal Materials Handling Show, to be held at the Show Mart, Berri Square, Montreal, Canada. For further information, write to E. M. Wilcox, Manager, 19 Melinda St., Toronto, Canada.

JANUARY 25-28, 1954—PLANT MAINTENANCE AND ENGINEERING SHOW to be held at the International Amphitheater, Chicago, Ill. For further information write to Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N. Y.

\* \* \*

### Chase Film Shows Production of Brass Mill Products

"The Science of Making Brass" is the title of a 16-millimeter sound motion picture recently produced by Chase Brass & Copper Co. Inc., a subsidiary of the Kennecott Copper Corporation, Waterbury, Conn. This film will be lent to metal-working companies and societies, as well as state and local technical groups or schools. The film runs for twenty-nine minutes, and describes the production of brass in terms understandable to the layman, beginning with the casting shop to the final distribution of brass sheet, rod, wire, and tubing to industry. Castings, extrusion, drawing, and rolling processes are shown.

\* \* \*

Aluminum is the only mass-produced material that costs less now than before World War II.

### Automatic Sealing of Castings

A fully automatic process for sealing porous aircraft engine castings with liquid synthetic resin has been put into operation in Pratt & Whitney Aircraft branch plants at Southington and North Haven, Conn. It is believed to be the first of its kind in any industry. The operation makes aluminum and magnesium castings oil-tight through vacuum-pressure impregnation of Permafil resin produced by the General Electric Co.'s chemical division, Pittsfield, Mass.

After being cleaned, jet- and piston-engine castings up to 80 inches in diameter are placed in 1500-gallon autoclaves under a 28-inch vacuum to eliminate air pockets. Permafil is then introduced and light pressure applied for about twenty minutes. After pressure is released, castings are drained, easily washed, and baked for four hours to cure the resin to a hard infusible solid that fills every pore of the metal.

Operating costs are lower than originally estimated. Deep penetration of the pores enables subsequent machining with no effect on the seal. Castings withstand gas and liquid pressures at sustained engine temperatures of 150 degrees C.

\* \* \*

### Steel Industry has First 10,000,000-Ton Month

March, 1953, was a significant month in the industrial history of the United States. It was the first month in which steel production reached 10,000,000 tons, steel-making furnaces pouring an estimated total of 10,168,000 net tons of ingots and steel for castings.

This production is equivalent to about 7,500,000 tons of finished steel products, or enough to provide steel for all the following: 2,000,000 automobiles; 1,000,000 each of kitchen stoves, household refrigerators, and washing machines; 10,000 railroad box cars; all the steel shipped directly from steel mills last year for ordnance and other military purposes; aircraft, oil and gas-drilling, mining, quarrying, and lumbering; and cutlery and utensils for 8,000,000 kitchens. After all of this, there would still be a small amount of steel left!

\* \* \*

Every time there has been a reduction in the Federal tax rates, the following year has seen an increase in the amount of over-all revenue collected by the Government. The Chamber of Commerce of the United States is the source of this encouraging information.

Standard sizes and types of Bushings are listed in Ex-Cell-O Catalog No. 35371. Write for as many copies as you'll need for your purchasing and engineering departments.

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# New Books and Publications

**FABRICATED MATERIALS AND PARTS.** By T. C. DuMond. 5 3/4 by 8 3/4 inches. Published by the Reinhold Publishing Corporation, 330 W. 42nd St., New York 36, N. Y. Price, \$6.50.

Twenty major methods of making small industrial parts are described, analyzed, and compared in this book, whose author is also editor of *Materials & Methods*. Fully considered are costs, materials used, advantages, limitations, design factors, and the sizes and tolerances possible with each of these methods. The text was written for the design, production, project, or materials engineer, the purchasing agent, and the company executive—all of whom are responsible for how a part is produced.

The following are the chapter headings: The Problem of Selecting Methods for Small Parts; Cost as a Factor in Selecting Fabricated Materials and Parts; Production and Design Factors; Sand Castings; Permanent Mold Castings; Plaster Mold Castings; Die Castings; Investment Castings; Drop Forgings; Press Forgings; Upset Forgings; Cold-Headed Parts; Stampings and Press Formed Parts; Impact Extrusions; Extruded Shapes; Powder Metal Shapes; Spun Shapes; Screw Machine Parts; Electroformed Parts; Sectioned Tubing; Welded, Brazed, and Adhesive Bonded Parts; Molded Plastics; and Formed Non-Metallic Materials.

**MECHANICAL POWER TRANSMISSION MANUAL.** By William A. Williams. 423 pages, 6 by 9 inches. Published by the Book Division, Conover-Mast Publications, Inc., 205 E. 42nd St., New York City. Price, \$6.

The selection of a proper drive for a job requires a working knowledge of the fundamentals and general characteristics of the different types of mechanical power transmission equipment. But the variety of equipment and continual improvements have made it difficult for design and operating engineers to keep abreast with proper applications. In this manual, the author has presented not only basic facts, but has shown how they can and should be used in selecting the right drive for the job. The following are the chapter headings: History of Power Transmission; Fundamentals of Mechanical Power Transmission; Motors and Engines; Shafting; Bearings; Belt Transmission Theory; Flat Belt Transmission Practice; V-Belt Transmission Practice; Motor Bases; Timing Belt Drive; Variable Speed Transmission; Chain Drives; Gear Drives; Shaft Couplings; Clutches; Drive Selection; and Vibrations.

**GAS TURBINE ANALYSIS AND PRACTICE.** By Burgess H. Jennings and Willard L. Rogers. 487 pages, 6 1/4 by 9 1/4 inches. Published by the McGraw-Hill Book Co., 330 W. 42nd St., New York 36, N. Y. Price, \$8.50.

This text on gas turbines was prepared by the authors to meet the need of undergraduate and graduate engineering students for a book presenting a broad, but not detailed, coverage of the operating characteristics, industrial scope, and position that the gas turbine now holds and will attain in coming years. It is assumed that the readers will have some knowledge of basic thermodynamics and mechanics. The material presented deals specifically with the types of problems associated with gas compression and gas-turbine operations. A set of tables of air properties is included to simplify the work required in solving problems. The chapter headings will indicate the contents of the book: Development of the Internal-Combustion Engine and Turbine; Thermodynamics and Air Properties; Gas-Turbine Cycles and Thermodynamic Analyses; Gas Turbine Types and Design Features; Axial-Flow Compressors; Centrifugal and Displacement Compressors; Aircraft Propulsion and Jet Engines; Power Plant and Transportation Turbine Units; Fuels, Combustion, and Combustion Chambers; Stresses in Turbine-Plant Elements; Vibration and Balancing; and Materials and Metallurgy.

**WELDABILITY OF STEELS.** By Robert D. Stout and W. D'Orville Doty. 381 pages, 6 by 9 1/2 inches. Published by the American Welding Society, 33 W. 39th St., New York 18, N. Y. Price, \$6.50.

According to the Weldability Committee of the Welding Research Council, a mass of information on the weldability of carbon and low-alloy steels has accumulated during the last fifteen years. A critical analysis and a digest of this subject were needed. Accordingly, the authors of this book prepared this volume. The first chapters are devoted briefly to the fundamental welding processes and metallurgy. Next comes a consideration of the basic factors which influence the weldability of carbon and low-alloy steels, after which are presented suggested methods for welding commonly used steels. The remaining chapters contain a review and critical evaluation of weldability tests and general conclusions on present-day knowledge of weldability. An appendix consists of fifty pages of tables on suggested procedures.

**ENGINEERING DATA ON THREAD AND FORM ROLLING.** 41 pages, 8 1/2 by 11 inches. Published by the Reed Rolled Thread Die Co., Box 350, Worcester 1, Mass. Price, \$1.

This pamphlet contains engineering data intended to provide a source of comprehensive technical information on thread and form rolling for design and process engineers and for those actively engaged in the application of the thread rolling process. The following subjects are covered: the thread rolling process; advantages and applications of rolled threads; equipment and tools for producing rolled threads; rollability of materials; preferred forms for rolling; blank specifications; thread rolling trouble check list; and reference tables.

**THE INERT-GAS-SHIELDED METAL-ARC WELDING PROCESS.** By W. H. Wooding. 30 pages, 8 1/4 by 11 1/4 inches. Published by the American Welding Society, 33 W. 39th St., New York 18, N. Y. Price, \$1.

Reprint covering the development of the inert-gas-shielded metal-arc welding process, the equipment required, the necessary controls and their function, the operation of the equipment, and safety precautions.

**AMERICAN STANDARD SPINDLE NOSES AND ARBORS FOR MILLING MACHINES (ASA B5.18-1953).** 7 pages, 8 1/2 by 11 inches. Published by the American Society of Mechanical Engineers, 29 W. 39th St., New York 18, N. Y. Price, \$1.

**AMERICAN STANDARD SMALL SOLID RIVETS (ASA B18.1-1953).** 11 pages, 8 1/2 by 11 inches. Published by the American Society of Mechanical Engineers, 29 W. 39th St., New York 18, N. Y. Price, \$1.

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Repro-Templates Inc., Oakmont, Pa., now has available for lay-out use templates of standard machine tools and metal-working plant equipment. Printed on 0.0075-inch thick acetate film, the templates are used with film grid sheets to provide quick and foolproof two-dimensional plant lay-outs. The templates represent the over-all dimensions of the machine or piece of equipment. They are clearly identified with lettering, and show in dotted lines the floor contact base. The more than 10,000 different items now in stock have been checked for accuracy by the manufacturers of the machines and equipment.



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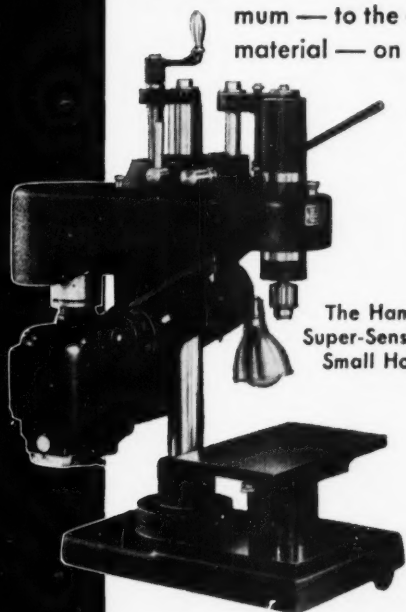
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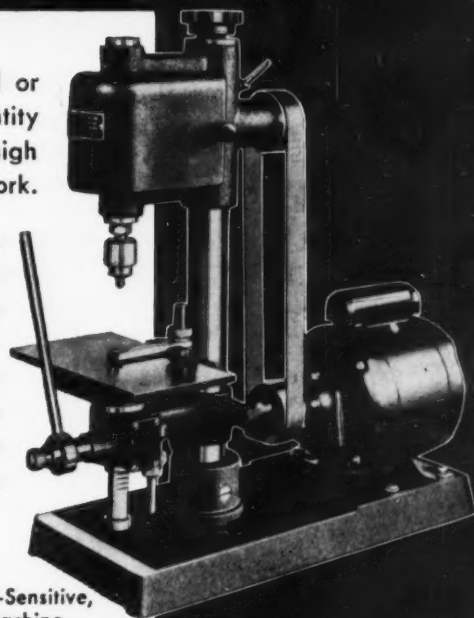
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## New Book on Pipe Bending

**PIPE AND TUBE BENDING.** By Paul B. Schubert. 183 pages, 6 by 9 inches; 159 illustrations. Published by THE INDUSTRIAL PRESS, 148 Lafayette St., New York 13, N. Y. Price, \$5.

Essentially this book is a practical working manual which describes and illustrates all the common methods of bending ferrous and non-ferrous pipe and tubing, and the machines, fixtures, and devices used. Data and pointers are given which are useful in both the shop and the field. The author has written for shop and field men, designers, and engineers who are concerned with the bending of pipe and tubing in the manufacture of aircraft, automobiles, and furniture; for the food and chemical industries; and for radiant heating installations. The information and data are so arranged that the reader can readily compare the various methods, and become familiar with their respective advantages and limitations.

In the first chapter, descriptions of all methods are given, together with their applications. Drawbacks or limitations that may be encountered are pointed out for each method, and the ways in which the particular method differs from others are made clear. Subsequent chapters describe each

method in detail, various commercial machines, and the procedures to be followed for different types of bending operations.

A chapter devoted to the layout of pipe for bends gives the formulas employed for various degrees of bend, and includes valuable material and data concerning minimum radii of bends. Information presented on topics such as fillers, mandrels, wooden dies, hot bending, pipe- and tube-coiling, and bending operations in the field has not heretofore been readily available in book form.

Chapter headings of the book

are as follows: Methods of Bending; Lengths and Minimum Radii of Bends; Use of Fillers and Mandrels in Bending; Compression Bending; Draw Bending; Ram and Press Bending; Roll Bending; Wrinkle-Bending; Hot Bending of Large-Sized Pipe and Tubing; Production Pipe Bending Using Wooden Forming Dies; Pipe- and Tube-Coiling; and Bending Operations in the Field. There are two appendices—Procedure for Dimensioning Drawings of Bent Parts; and Classifications of Tubing.

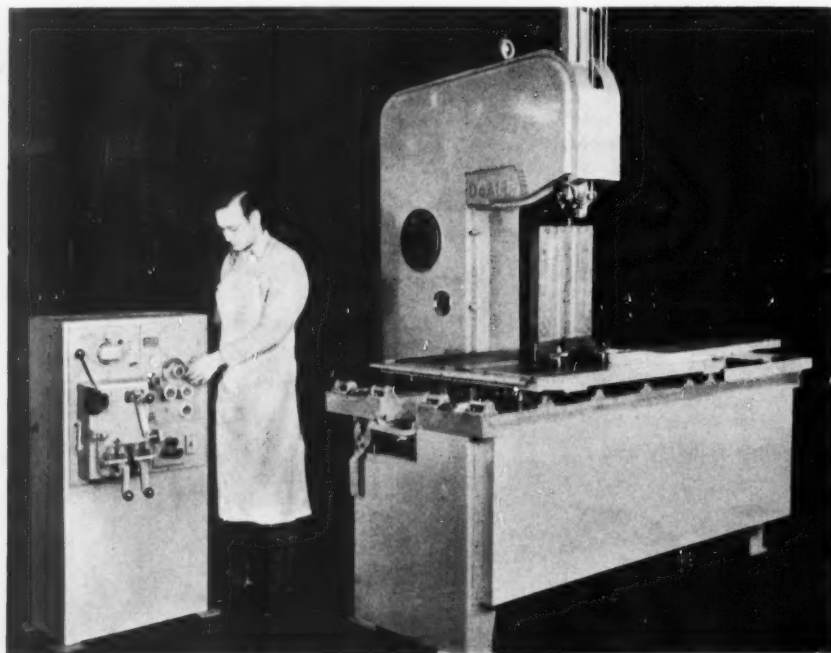
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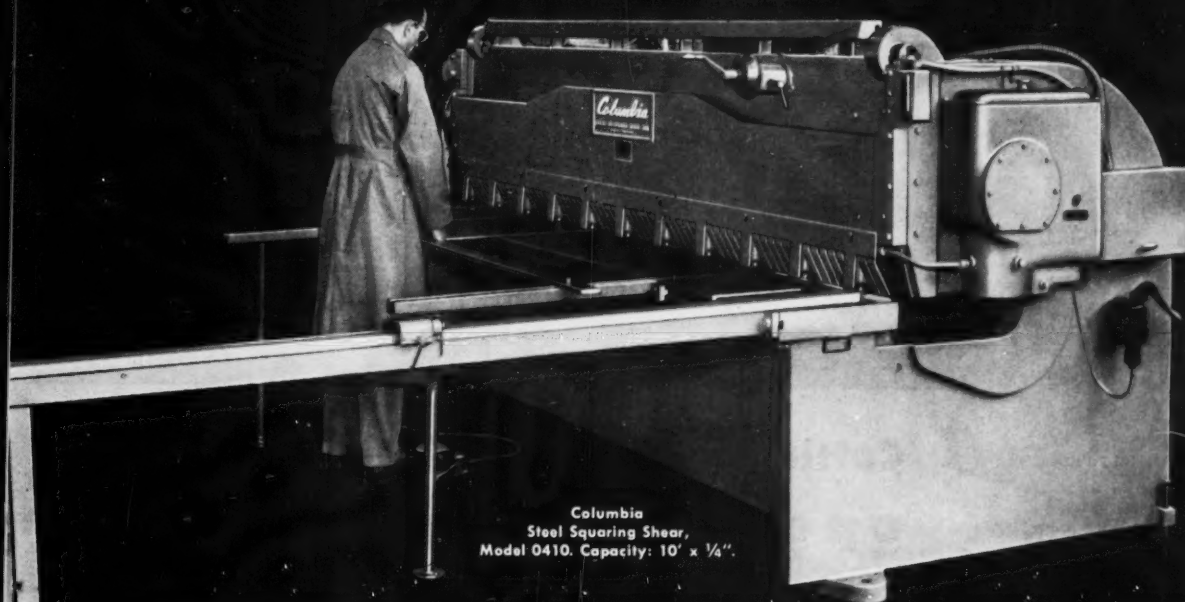
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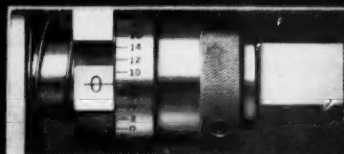
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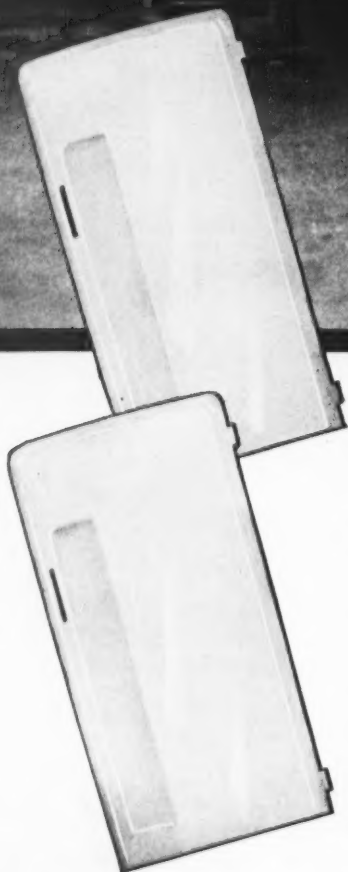
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For help with your problem, call for the services of your Standard Oil lubrication specialist. Phone your local Standard Oil office.



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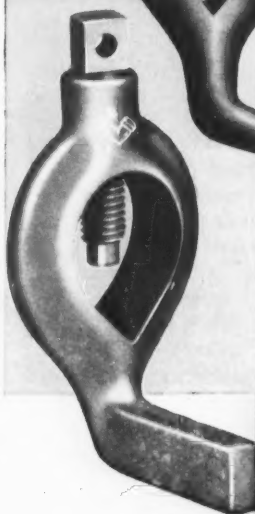
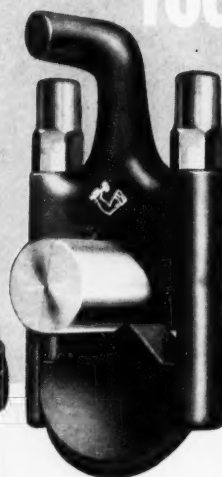
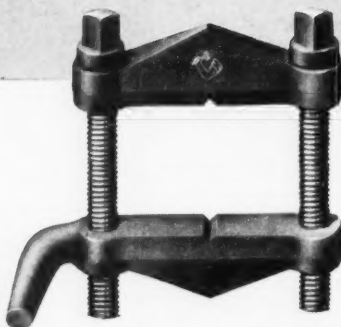
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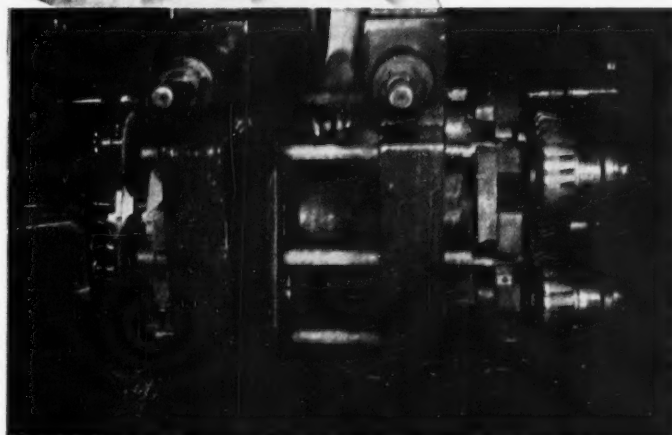
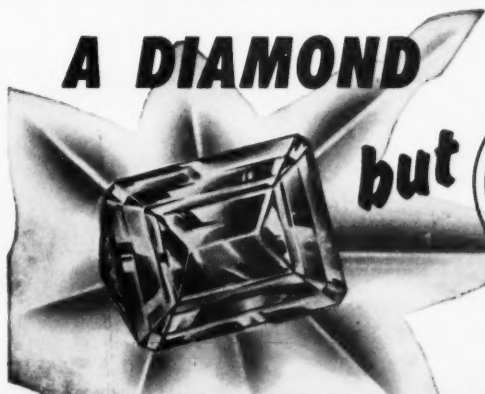


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Speed . . . . . 8"—387 S.F.M.  
6"—290 S.F.M.

Feed . . . . . 14" per minute

Production . . . 150 pcs. per hour

1500-1700 pcs. per grind

Grade of Carbide . . . Wessonmetal WM

## SAVINGS OF OVER \$14,225 PER YEAR ON ONE MACHINE WITH ONE SET OF WESSON TOOLS

### OLD METHOD

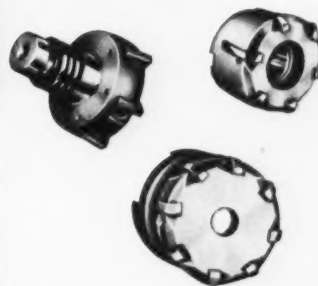
Cost 1 set Inserted Blades . . . . \$48.00  
Pieces per Grind . . . . . 275  
Grinding Hours per year . . . . 10,300  
5 Machines Running 3 Shifts  
Machine Repair per year . . . . \$25,000  
Tool Cost per Piece . . . . . \$0.0545\*

\*(Machine repair and grinding costs not included)

### NEW WESSON ENGINEERED METHOD

Cost 1 set Inserted Blades . . . . \$54.60  
Pieces per Grind . . . . . 1600  
Grinding Hours per year . . . . 2500  
3 Machines Running 2 Shifts  
Machine Repair per year . . . . \$1200  
Tool Cost per Piece . . . . . \$0.0213\*

## HOW IS YOUR PRODUCTION SCORE CARD!



Write today for folder  
on Wesson's  
educational, full color,  
sound movie —  
"This Carbide Age."

Call Your  
WESSON SERVICE ENGINEER —

**WESSONMETAL**  
Cemented Carbide

# WESSON METAL CORPORATION

LEXINGTON, KENTUCKY

Affiliated with WESSON COMPANY, Detroit, Mich.

# WHY DO YOU SUPPOSE SO MANY OF THE DRILLS YOU USE COME TO YOU "Sellers Ground"?

It's because ...

**Leading Drill manufacturers use Sellers Drill Grinders to point grind their drills. They also recommend them for maintaining their customers' drills at top efficiency.**

## **SELLERS DRILL GRINDERS CUT DRILLING COSTS THROUGH ...**

**INCREASED PRODUCTION.** Free cutting, accurate drills permit drilling machines to be operated at their most efficient speeds.

**LONGER DRILL LIFE.** Less drill material is ground off when re-sharpening drills.

**MORE HOLES PER GRIND.** Correctly ground drills remain sharp for a greater number of holes.

**REDUCED ASSEMBLY COSTS.** Eliminates under- and over-size holes. Saves reaming and boring.

**RECLAIMS DAMAGED DRILLS.** Sellers grinding method reclaims many burned and broken drills that are ordinarily scrapped.

**ECONOMICAL.** Sellers Grinders have been known to earn their cost as many as six times over within one year. Readily operated by skilled or unskilled operators.

**For grinding  
2, 3 and 4 lip  
twist Drills**

**Among Heavy Machine  
Tools built by  
Consolidated are . . .**

LATHES  
BORING MILLS  
DRILL PRESSES  
MILLING MACHINES  
BORING MACHINES  
COLD SAW MACHINES  
BORING, DRILLING AND  
MILLING MACHINES  
DRILL AND TOOL  
GRINDERS  
PLANERS  
SLOTTERS  
RAILROAD SHOP TOOLS  
AUTOMOTIVE TOOLS  
AND OTHER  
SPECIAL MACHINES

## **SELLERS No. 6-G DRILL GRINDER**

A wet grinder especially adapted to grinding high speed twist drills from  $\frac{1}{16}$ " to 3" diameter, this machine provides a distinctly improved method of grinding that produces correctly formed drill points with duplicate lips. It automatically determines proper clearance according to drill size and grinds drills to equal length for use with multiple spindle drilling machines. Among other advantages, this method materially reduces drill maintenance costs. Other Seller Drill Grinders are available in sizes to handle drills down to .028" (No. 70) diameter. Built to last, Sellers Drill Grinders have an unusual record for long operating service, with some in operation for thirty years and longer. With ordinary care, part replacements are negligible, however when required, replacement parts are always available. Complete information will be furnished upon request.

**BUILDERS OF HEAVY DUTY MACHINE TOOLS SINCE 1848**

BETTS • BETTS-BRIDGEFORD • COLBURN • HILLES & JONES • MODERN • NEWTON • SELLERS



# **CONSOLIDATED MACHINE TOOL CORPORATION**

SUBSIDIARY OF FARREL-BIRMINGHAM COMPANY, INCORPORATED

**ROCHESTER, NEW YORK**



**ANOTHER GIANT CONSOLIDATED SPECIAL MACHINE  
FOR UNUSUALLY LARGE WORK**

**SELLERS  
COMBINATION  
PLANER-MILLING  
MACHINE**

**Among Heavy Machine  
Tools built by  
Consolidated are . . .**

LATHES  
BORING MILLS  
DRILL PRESSES  
MILLING MACHINES  
BORING MACHINES  
COLD SAW MACHINES  
BORING, DRILLING AND  
MILLING MACHINES  
DRILL AND TOOL  
GRINDERS  
PLANERS  
SLOTTERS  
RAILROAD SHOP TOOLS  
AUTOMOTIVE TOOLS  
AND OTHER  
SPECIAL MACHINES

**SELLERS COMBINATION PLANER-MILLING MACHINE PLANING A HUGE CASING**

The Sellers Combination Planer-Milling Machine is used in the production of equipment for industrial and power generating applications such as, synchronous condensers, hydraulic turbine-driven generators and large motors and generators for steel mills and similar installations. Two machines in one . . . a planer and a miller . . . it eliminates the necessity of transferring work from one machine to another when both planing and milling operations are required. This huge machine is over 76 feet long, 27 feet high and weighs more than 645,000 pounds. It has the capacity to machine work 14 feet wide, 16 feet high and 30 feet long. Due to the enormous capacity of the machine, several parts to be machined may be bolted together and handled as a single unit.

**BUILDERS OF HEAVY DUTY MACHINE TOOLS SINCE 1848**

BETTS • BETTS-BRIDGEFORD • COLBURN • HILLES & JONES • MODERN • NEWTON • SELLERS



**CONSOLIDATED  
MACHINE TOOL CORPORATION**

SUBSIDIARY OF FARREL-BIRMINGHAM COMPANY, INCORPORATED

**ROCHESTER, NEW YORK**



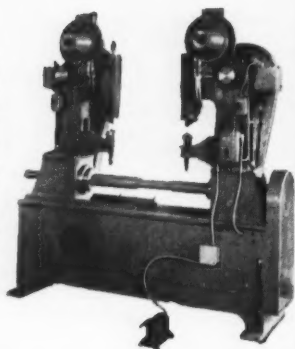
# Speed Production... Automatically with

## RIVITORS



**T-J RIVITOR** used for automotive clutch plate assembly. Saves time and labor doing a four-fold job—assembling, setting, inspecting and ejecting.

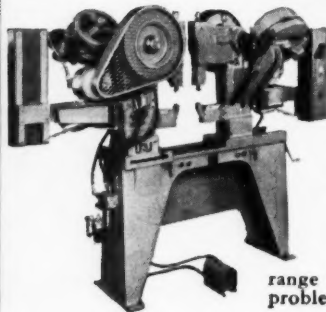
**DOUBLE RIVITOR** sets two rivets at a time! Equipped with 10" hoppers, and tooled to automatically feed and set two  $\frac{1}{4}$ " dia. x  $\frac{3}{8}$ " long wagon box head rivets at a time in elevator chain and raddle or elevator flight assemblies for farm implements. Controlled by one foot pedal.



## CLINCHORS



**T-J CLINCHOR** . . . one of six special 8" throat Underfeed Clinchors used by a large automotive body manufacturer. Feeds and sets  $\frac{1}{16}$ " square cased nuts in outside quarter panels, left and right hand.



### DOUBLE CLINCHOR

sets two nuts at once! Tooled to feed and set  $\frac{3}{8}$ " x  $\frac{1}{2}$ " x  $\frac{1}{16}$ " thick Fabri-Steel nuts at each operation. Both Clinchors tripped by same foot-operated valve. Adaptable to wide range of clinch nut setting problems.

Boost production . . . save labor with T-J Rivitors and Clinchors for many assembly jobs today . . . in aircraft, automotive, farm machinery, stampings of all kinds.

**T-J CLINCHORS** set clinch nuts 3 to 5 times faster! Fully automatic . . . controlled by a single foot pedal! Available in Underfeed and Gravity feed models, throat depths 8" to 36".

**T-J RIVITORS** automatically feed and set solid rivets . . . with high production! Electrically-powered Rivitor sets  $\frac{1}{16}$ " to  $\frac{1}{4}$ " diam. solid steel rivets up to  $\frac{7}{8}$ " long. Air-powered Rivitor sets aluminum alloy rivets up to  $\frac{1}{4}$ " diam. or steel rivets up to  $\frac{1}{8}$ " diam. and up to  $\frac{3}{4}$ " long. Throat depths 8" to 36".

Write for Clinchor bulletin 847; Rivitor bulletins 646 and 847. The Tomkins-Johnson Co., Jackson, Mich.

**37 YEARS  
EXPERIENCE**

# TOMKINS-JOHNSON

RIVITORS AIR AND HYDRAULIC CYLINDERS CUTTERS CLINCHORS

**T-J**

*Ask your Distributor*



*Photograph by Paul Davis*

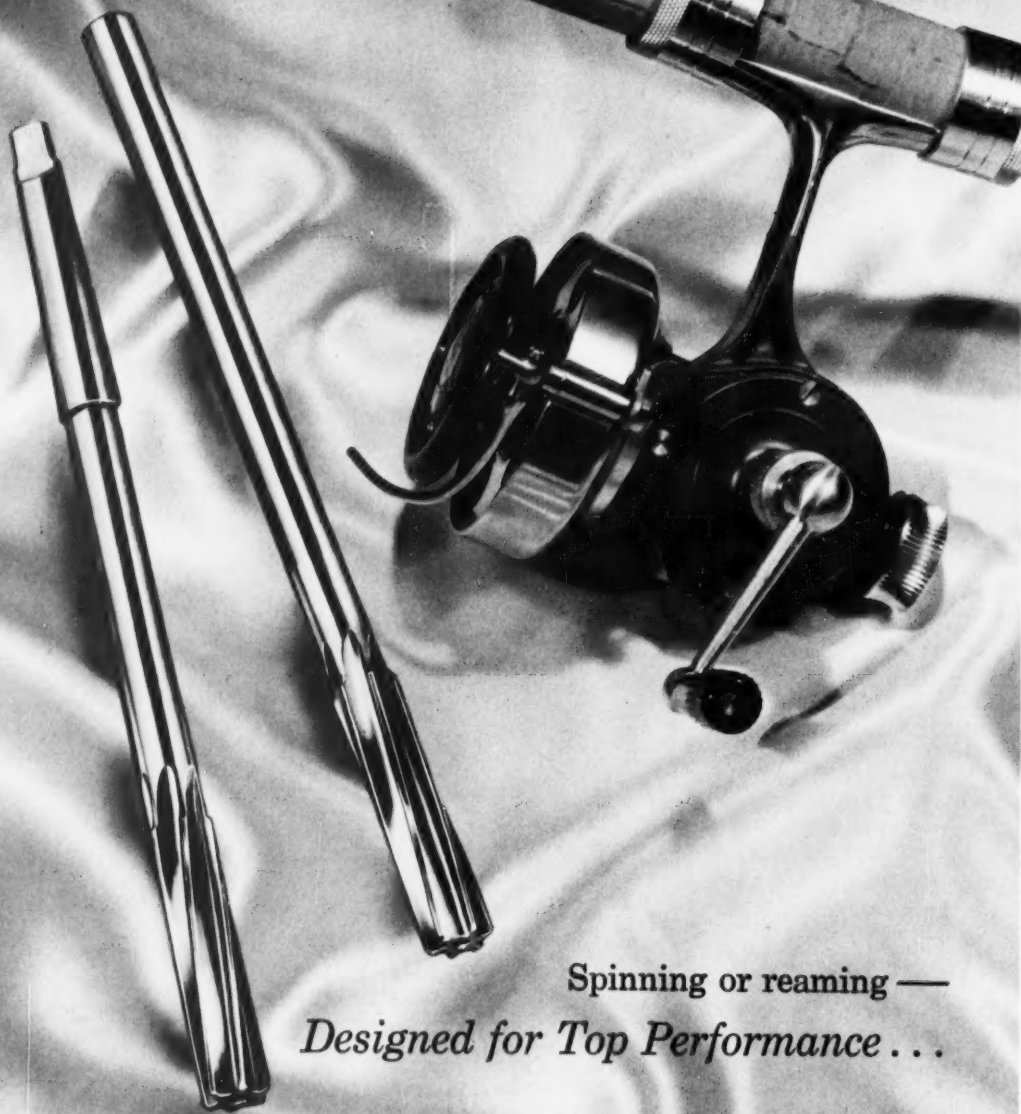
Part of Butterfield's fine reputation for taps and dies  
stems from rigid control over quality production.  
The value shows up in performance.

**B U T T E R F I E L D**

*Union Twist Drill Company Butterfield Division Derby Line, Vermont, U. S. A.*

**TAPS • DIES • REAMERS • DRILLS • COUNTERBORES • SCREW PLATES**

# U N I O N



Spinning or reaming —  
*Designed for Top Performance . . .*

*Photograph by Paul Davis*

**UNION TWIST DRILL COMPANY • ATHOL, MASSACHUSETTS**

**Milling Cutters   Gear Cutters   Twist Drills   Hobs   Reamers   Carbide Tools**

**OWNERS AND OPERATORS OF: S. W. CARD MANUFACTURING CO. DIVISION, Mansfield, Mass.**

**BUTTERFIELD DIVISION, Derby Line, Vermont and Rock Island, Quebec**

**CUT INVENTORY COSTS—ORDER FROM YOUR LOCAL UNION DISTRIBUTOR**



*Photograph by Morton Berger*

## TAPS *by* CARD

*The quality is greater than the price. When you specify Card Taps you get far more than fine steel expertly engineered. You get the benefit of an accumulation of experience in tap making that dates back 79 years.*

*Completely stocked offices at Chicago, Detroit, Fort Worth, Los Angeles, New York, San Francisco and Seattle.*

*See your local Card distributor for prompt deliveries and helpful service*

S. W. CARD MANUFACTURING CO., MANSFIELD, MASS. • DIVISION OF UNION TWIST DRILL CO.



TAPS • DIES • SCREW PLATES



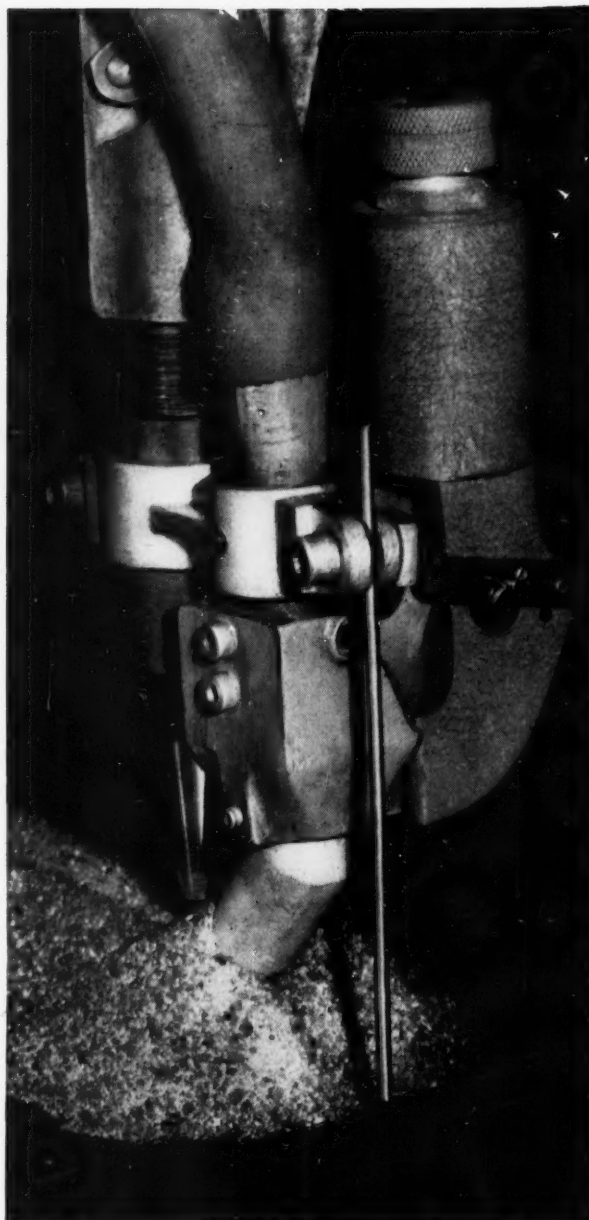
Two important parts of  
**UNIONMELT** WELDING  
Trade-Mark

*You Can't See*

This is UNIONMELT welding—instantly recognized by the special granulated material you see blanketing the weld. *You can't see* the powerful electric arc that fuses the metal beneath at the highest production rate attainable. No sparks or glare disrupt nearby plant activity.

*You can't see* the LINDE SERVICE that stands behind every UNIONMELT installation to assure its efficient and profitable operation. Only LINDE can give you this unique combination of research, engineering, and over 40 years of welding know-how that is helping LINDE customers save money and improve production. And only LINDE can give you the accumulated benefits of more than 18 continuous years of development, field testing, and improvement in the field of submerged melt welding where it pioneered.

LINDE's Service Engineers will gladly help you design a UNIONMELT installation to meet your exact requirements. They will also be available to help you when a tough production problem comes up. Call your nearest LINDE representative today.



*Linde*  
TRADE-MARK

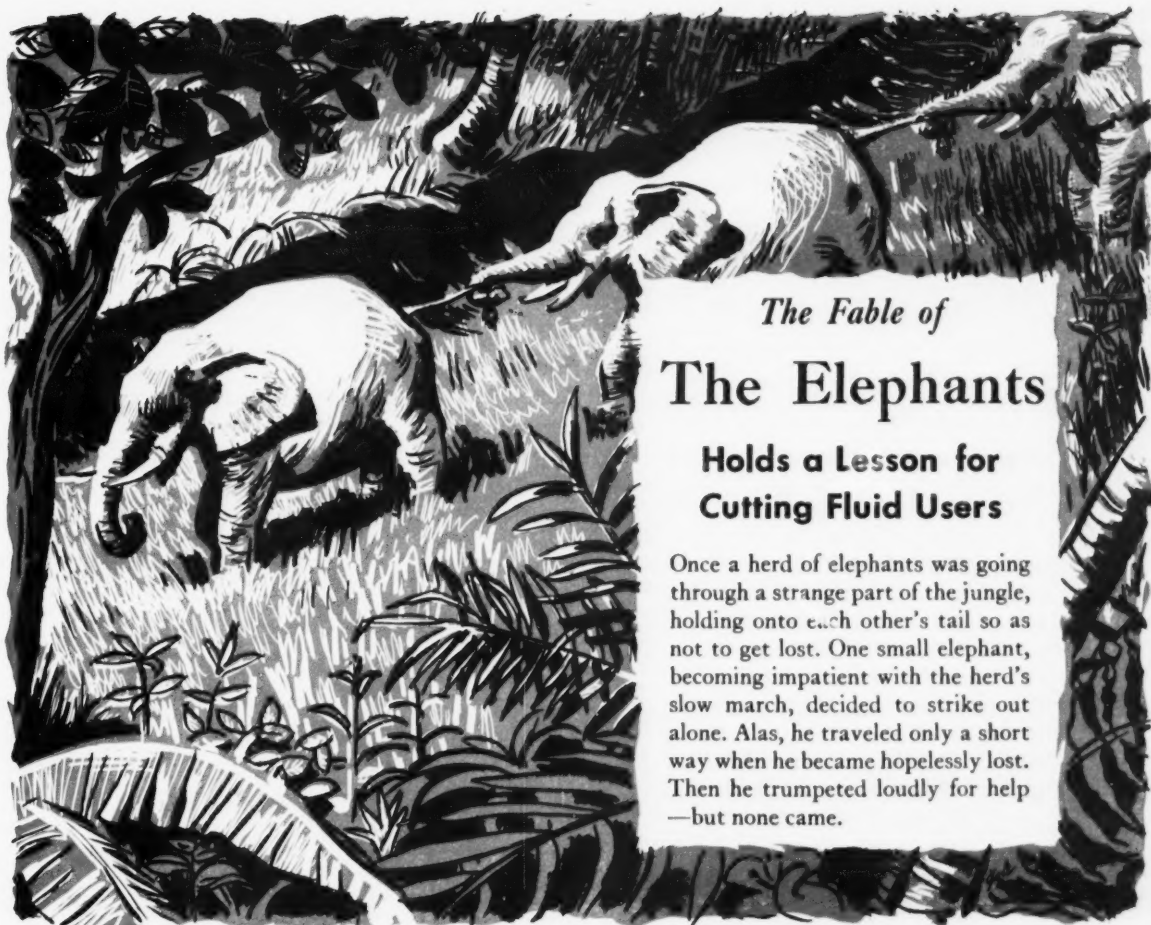
**LINDE AIR PRODUCTS COMPANY**

A Division of Union Carbide and Carbon Corporation  
30 East 42nd Street **UCC** New York 17, N. Y.

Offices in Other Principal Cities

In Canada: DOMINION OXYGEN COMPANY, LIMITED, Toronto

*The terms "Linde" and "Unionmelt" are registered trade-marks of Union Carbide and Carbon Corporation.*



## *The Fable of* **The Elephants**

### **Holds a Lesson for Cutting Fluid Users**

Once a herd of elephants was going through a strange part of the jungle, holding onto each other's tail so as not to get lost. One small elephant, becoming impatient with the herd's slow march, decided to strike out alone. Alas, he traveled only a short way when he became hopelessly lost. Then he trumpeted loudly for help—but none came.

### *The Lesson:*

Like the little elephant in the fable, it is easy to get lost in the cutting fluid jungle. You need something to follow if you are to stay out of trouble. Realizing this, Stuart Oil has devised a unique Selector to serve as a guidepost to point out the path to the right cutting fluid. The Selector recommends cutting and grinding fluids which field experience has shown to be most suitable under average job conditions. Machinability ratings are listed, and complete instructions are given. Included are rules of thumb to follow when short tool life and poor surface finish are encountered.

To make going astray even more difficult, Stuart has developed the Dilut-O-Graph which tells how much cutting oil is required for a certain dilution when blending is done in tanks of different capacities. The Dilut-O-Graph ends costly guess-work.

Your Stuart Oil Representative will gladly give you a Selector and Dilut-O-Graph. And while he is in your plant, ask him to show you how Stuart cutting and grinding fluids will improve your machining results.

**FREE** CUTTING FLUID SELECTOR  
AND DILUT-O-GRAPH



In this folder is Stuart's Cutting Fluid Selector and Dilut-O-Graph. They are double-barreled protection against mistakes in selecting and preparing cutting fluids. Instructions are included. Fill out and mail coupon.

**More Than a "Coolant" is Needed**

**D. A. Stuart Oil Co.**  
EST. 1865 LIMITED

TIME-TESTED CUTTING FLUIDS AND LUBRICANTS

**2739 S. Troy St., Chicago 23, Ill.**

In Canada: R. W. Horsey Canada, Ltd.  
Subs. D. A. Stuart Oil Co., Ltd.  
3575 Danforth Ave., Toronto

CLIP TO YOUR COMPANY LETTERHEAD AND MAIL  
D. A. Stuart Oil Co., Ltd., 2739 S. Troy St.,  
Chicago 23, Ill.

- ☐ Have Stuart Representative Call  
☐ Send Cutting Fluid Selector & Dilut-O-Graph Folder

Your Name .....

Title .....



# Arbors take heavy

**Rigidmils factory-equipped with Scully-Jones "Precision Holding" for accurate high production . . . long tool life!**

As the name implies, Sundstrand Rigidmils are noted for their accurate high production . . . their power, heavy construction and adaptability to this carbide age. That's why many Rigidmils are factory-equipped with Scully-Jones precision-built Milling Arbors . . . the arbors that save tool life and withstand the punishment of fast, heavy cuts!

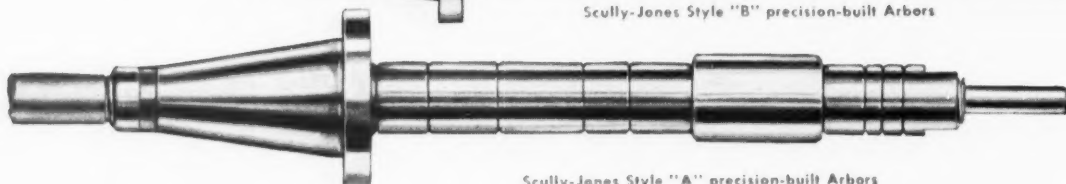
Here are some of the reasons Scully-Jones Arbors give you more for your tooling dollar. First, arbor and pilot diameters are held to plus .0000", minus .0005". Faces of spacers and sleeves are ground and lapped parallel within .0002". This means cutters run true, each tooth taking its share of the load—it means improved finish in the workpiece and tool life sav-

ings for you. Second, taper shanks have a finish of 10 to 20 micro-inch R. M. S. and are individually checked on light gauges to guarantee a perfect fit in the machine spindle and minimize cutter run-out. Third, they are built only from high-quality steel forgings . . . tough on the inside to provide maximum strength and minimize vibration . . . hard on the outside to resist nicking and wear.

Add to these features the low cost of tools produced and used in mass-production quantities and you have the reason Scully-Jones precision-built Milling Machine Arbors are the best buy for you! See your Scully-Jones Representative or Stocking Distributor for complete information and prices.



Scully-Jones Style "B" precision-built Arbors

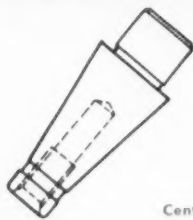


Scully-Jones Style "A" precision-built Arbors

**STYLE "A" ARBORS** with pilot end support, permit clearance along arbor when small cutters are used for light work. Standard sizes from  $\frac{3}{8}$ " to  $1\frac{1}{4}$ " diameter, with 40 and 50 NMTB standard tapers.

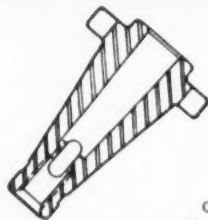
**STYLE "B" ARBORS** provide rigid setups, permit close-coupling of dual overarm supports with cutters. Variety of standard sizes, from  $\frac{7}{8}$ " to  $2\frac{1}{2}$ " diameter, with 40 and 50 NMTB standard tapers.

## THERE'S A SCULLY-JONES PRECISION TOOL FOR EVERY HOLDING OR DRIVING NEED



Centering  
Plugs

For centering face mill cutters which bolt directly to spindle end. Threaded holes for draw-in rod are standard: 40 taper  $\frac{3}{8}$ -11, 50 taper 1-8, r.h.



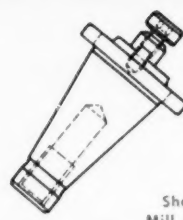
Collet  
Holders

For tapered taper collets and tools with No. 2, 3 or 4 Morse taper and No. 5, 7, 9, or 10 Brown & Sharpe taper. Other standard types available.



Cutter  
Adapters

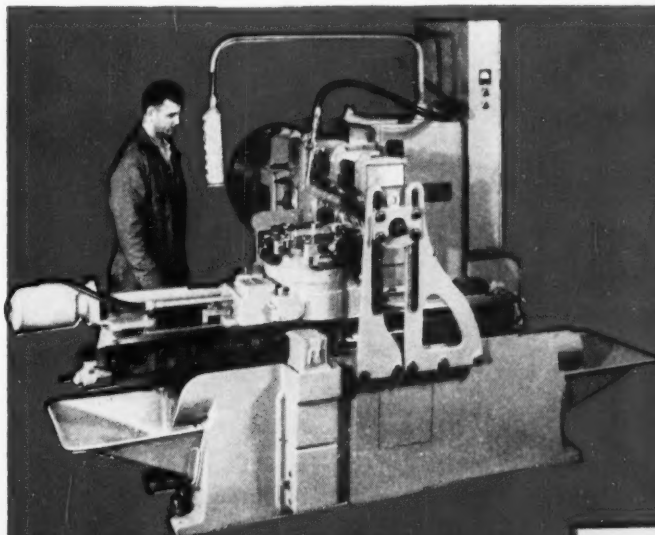
For holding straight shank end mills, single or double-end. Simplify tool changes. Threaded holes for draw-in rod are standard.



Shell End  
Mill Arbors

Style "C", shown, for machines having National Standard spindle end; Style "A" for use with adapters, Style "B" for vertical milling attachments.

# loads on Sundstrand Rigidmils



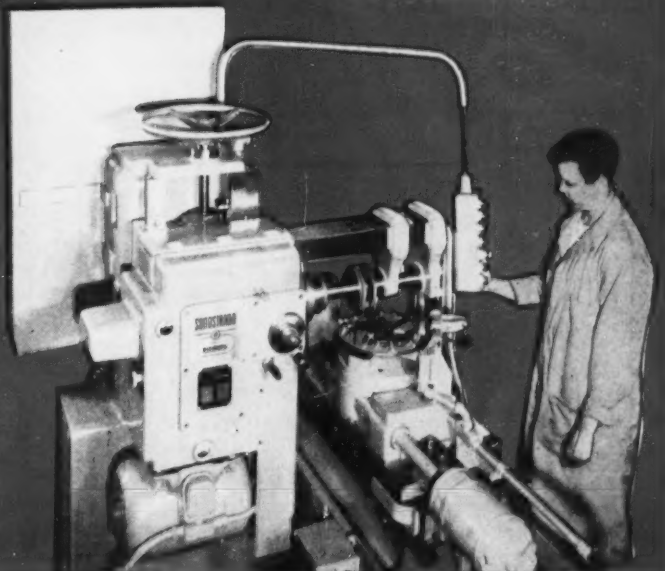
Standard Model 22 and 33 Rigidmils, manufactured by the Sundstrand Machine Tool Company, Rockford, Ill., exemplify modern high-production milling... with fast, automatic cycling, heavy, rigid construction, high horsepower, and special tooling for: rigid work holding, automatic indexing, quick loading and unloading. Scully-Jones precision-built Milling Arbors meet the high quality standards of Sundstrand's engineered production.

Producing 120 pieces per hour, this Model 33 Sundstrand Rigidmil machines slots in steel nozzle plates held in 90° automatic index base with four dual work holding fixtures. Scully-Jones 1½" Style "B" Arbor drives twelve 4½" high-speed steel side mills.

Straddle milling three lugs of cast iron clutch plates at rate of 54 per hour, Sundstrand Model 22 Rigidmil has automatic index base which permits machining all three lugs with only one handling of part. Scully-Jones Style "B" 1½" Arbor provides rigid drive required with 6" dia. carbide-tipped straddle mills.



Tough steel forgings are milled at the rate of 46 per hour on this Model 33 Rigidmil with special left and right hand work holding fixture. Special Scully-Jones Style "B" 2" to 1½" Step Arbor drives carbide-tipped and high-speed steel gang cutters for milling 1.875" slot, 1.640" groove and face of forgings.



**MORE FACTS**—Send for free catalog describing Scully-Jones "Precision Holding" Tools. Paste coupon to letter-head or postal card and mail today.

Gentlemen: I'm interested in learning more about Scully-Jones Tools.

- ☐ Please send Bulletin 2-50 describing Milling Machine Arbors and Adapters.  
☐ Send catalog describing your complete line.

Name \_\_\_\_\_

Company \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_

**SCULLY  
JONES**  
*Precision Holding*  
FOR HOLDING PRECISION

Scully-Jones and Company, 1906 South Rockwell Street, Chicago 8, Illinois

For more information on products advertised, use Inquiry Card, page 239

MACHINERY, September, 1953—273



# KUX

**FIRST NAME IN DIE CASTING MACHINES**



**USED TO PRODUCE  
DORMEYER  
FIRST NAME IN MIXERS**

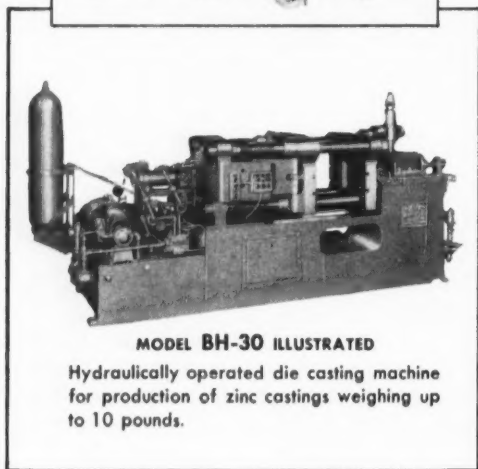
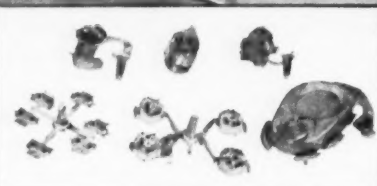
**Beats • Mixes • Grinds • Stirs  
Juices • Whips • Slices • Shreds**

...The new Dormeyer Power-Chef performs all! To produce the die cast parts of this famous food-fixer demanded equipment of equal versatility and precision... And KUX • First Name in Die Casting Machines "delivered the goods" to perfection!

Kux improved die casting techniques means improved quality production of YOUR PRODUCT. Let Kux engineering know-how, show you how!

*Write for illustrated catalog showing complete line of KUX Die Casting Machines.*

**KUX MACHINE COMPANY**  
6725 N. Ridge • Chicago 26, Illinois

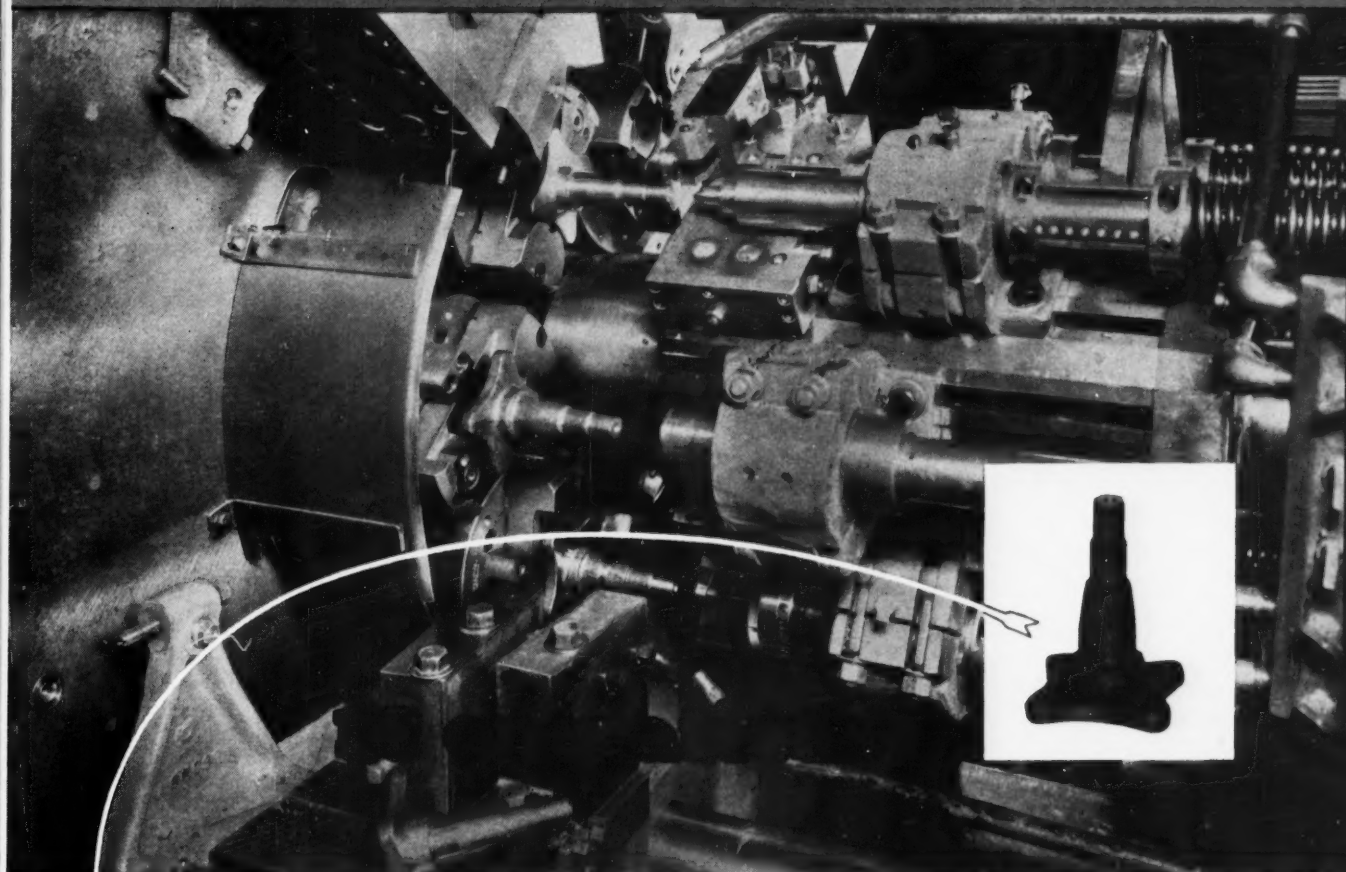


**MODEL BH-30 ILLUSTRATED**

Hydraulically operated die casting machine for production of zinc castings weighing up to 10 pounds.

# KUX

**FIRST NAME IN DIE CASTING MACHINES  
SELECTED BY FIRST NAMES IN INDUSTRY**



**in 16 seconds** on an 8-inch, 6-spindle

### ACME-GRIDLEY Hydraulic Chucker

When Willys-Overland Motors, Toledo, O. changed methods to cut machining costs on larger production runs of this forged wheel spindle, they didn't buy the machine on general claims. *They bought guaranteed end results—16 operations in 16 seconds.*

They bought a carefully engineered plan of tooling for this particular job—with hydraulic centering loader, unique toolholder combinations for the 16 carbide insert tools, including 5 interrupted cuts on the flange face at 860 S.F.M.

There is another reason—Willys-Overland, like all other big automotive firms, has employed scores of Acme-Gridley Bar Automatics from 10 to 30 years. Based on this experience, it is logical that they seek our advice

about advanced practices in tool engineering of Chucking Automatics.

For, no other source offers so much in design and tooling experience on bar and chucking automatics—more than 45,000 machines built.

For end results, cost savings, ask your engineers to contact ours.

#### JOB FACTS

|              |                            |
|--------------|----------------------------|
| PART         | Front Wheel Spindle        |
| SIZE         | 5¼" long, 4¾" swing        |
| MATERIAL     | Steel forging, AISI-C1040  |
| OPERATIONS   | 16, all with Carbide Tools |
| MACHINE TIME | 16 seconds (225 per hr.)   |

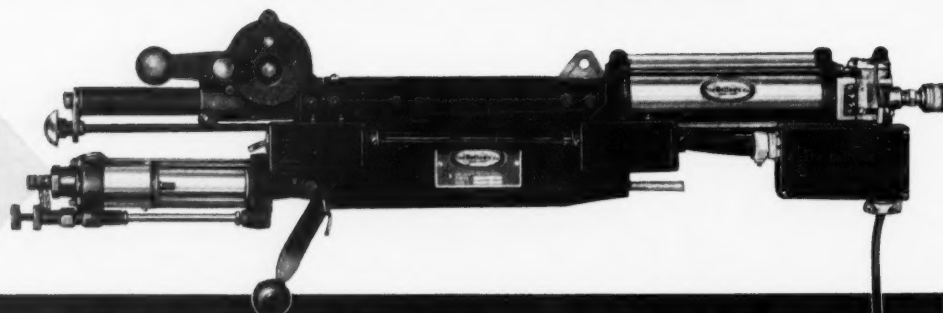
## The NATIONAL ACME COMPANY

170 East 131st Street • Cleveland 8, Ohio.

ACME-GRIDLEY BAR AND CHUCKING AUTOMATICS (1-4-6 AND 8 SPINDLE) • HYDRAULIC THREAD ROLLING MACHINES • AUTOMATIC THREADING DIES AND TAPS • LIMIT, MOTOR STARTER AND CONTROL STATION SWITCHES • SOLENOIDS • CONTRACT MANUFACTURING

# IF YOU DRILL HOLES

this



## CAN CUT YOUR COSTS IN HALF...

"This" is the Bellows Drill Press Feed. It goes on the star wheel shaft of any standard drill press. A touch on the operating lever and the Drill Press Feed advances the drill rapidly to the work, feeds the drill through the work at the correct feed rate, and returns the drill to its starting position. It's so simple in operation that workers with less than an hour's training can produce top quality work at top production rates.

It can be installed on a drill press in less than half an hour. It can be moved from one drill press to another. It doesn't interfere with hand operation of a drill press when desired.

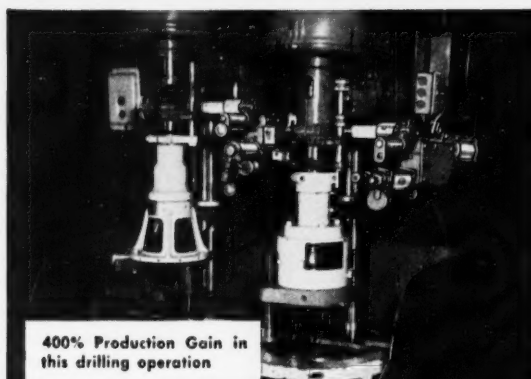
And, if the experiences of thousands of users are any criterion, it will pay for itself in your plant with the first two weeks' cost savings.

**If you drill holes — it can cut your costs in half.**

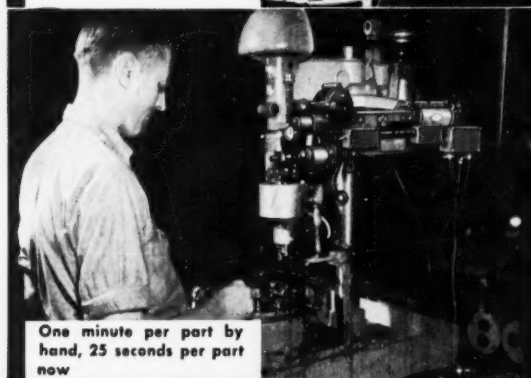
The Bellows Drill Press Feed is one of many "packaged" Controlled-Air-Power Devices to convert manually operated equipment to fast, low-cost automatic machines. New Bulletin CL-50 describes them all. Write for it today. No cost. No obligation. Address Dept. MA953, The Bellows Co., Akron 9, Ohio.

### The Bellows Co.

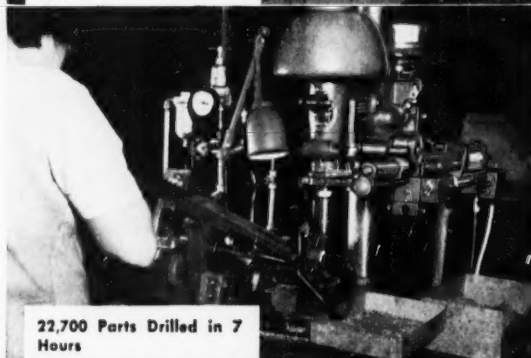
AKRON 9, OHIO



400% Production Gain in this drilling operation



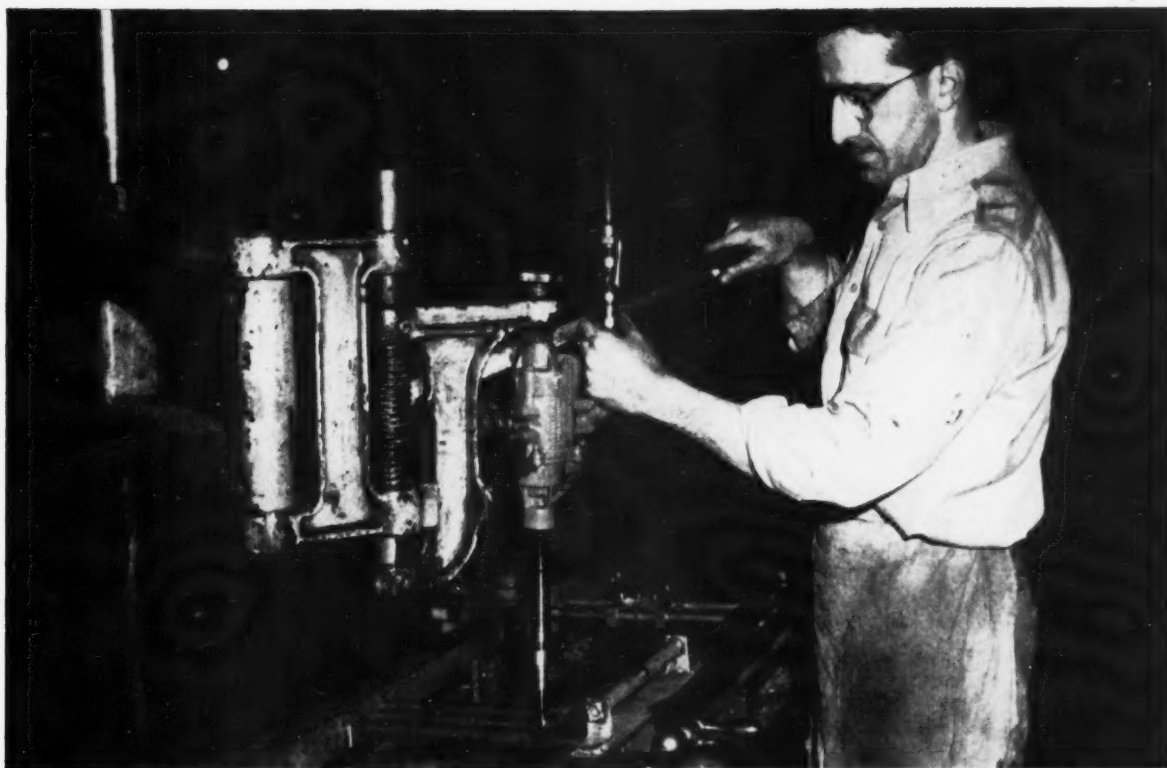
One minute per part by hand, 25 seconds per part now



22,700 Parts Drilled in 7 Hours

757a

FIELD ENGINEER OFFICES IN EVERY MAJOR CITY AND INDUSTRIAL AREA IN THE UNITED STATES AND CANADA



## Why have an air motor here?

This fixture is used to drill all types of sheet metal—including stainless steel—for commercial and industrial counters and partitions.

Such severe service—for sixteen hours a day—was too much for the motor previously used. Frequent shutdowns for repairs were upsetting production schedules.

Then a Cleco 101-A Drill motor was installed. This motor has been in service now for over a year *without requiring any maintenance!*

But there was also an additional bonus of increased output. The controllable speed and high stalling torque of the Cleco Air Motor gave operators the extra control they needed to drill holes faster and increase output. Needless to say, the manufacturer is more than pleased with the service he has gotten.

Phone, write or wire your nearest Cleco field engineer. Go over your production problems with him and see how Cleco Air Tools can increase output and cut costs. Do it right away.



### **CLECO DIVISION**

of the REED ROLLER BIT COMPANY, 5125 Clinton Drive, Houston 20, Texas, U.S.A.



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In Canada: Cleco Pneumatic Tool Company of Canada, Ltd., 927 Millwood Road, Toronto (Leaside), Ontario  
DISTRIBUTORS IN PRINCIPAL CITIES OF THE UNITED STATES AND THROUGHOUT THE WORLD

For more information on products advertised, use Inquiry Card, page 239

MACHINERY, September, 1953—277



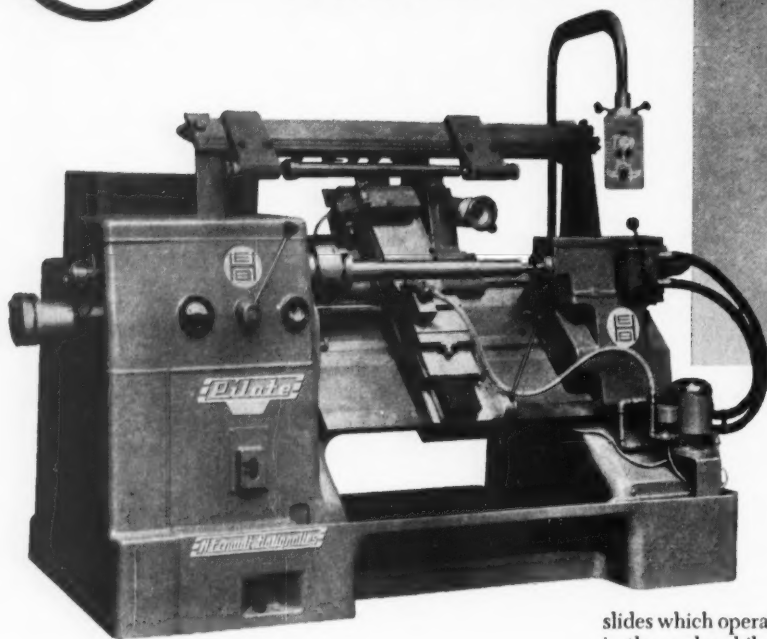
# ANNOUNCING...

## The Revolutionary New



### COMPLETELY AUTOMATIC

### HYDRAULIC COPYING LATHE



- Spindle speeds up to 3000 RPM.
- Front and rear tool slides are standard.
- Vertical infeed tool slides optional.
- Coolant system prevents distortion; permits highest speeds.
- Equally suitable for bar or chucking work.

Ushering in a new era in metal working, the new H.E.B. PILOTE is the first completely automatic copying lathe. The operator has only to load the machine and *press a button* to start the cycle. When the part is finished the tool returns to its starting position, and the spindle stops automatically!

At the touch of a button the front tool will take one or more roughing cuts over any necessary parts of the component, and finally, a finishing cut. Any narrow undercuts will automatically be cut by one or more rear tools, thus enabling the front tool to be sufficiently rugged to take heavy cuts . . . The rear tool may also be used for finishing any diameters requiring a micro-finish.

The lathe can be supplied with one or more vertical tool

slides which operate automatically at predetermined points in the cycle while the front tool is also cutting.

The patented H.E.B. hydraulic feed results in improved surface finish, and also simplifies setting up as there are no mechanical parts to adjust. By the design of the system, the feed per spindle revolution will remain exactly as set, regardless of the resistance met by the tool or variations in spindle speed.

The new PILOTE produces work unbelievably fast, accurately, and with a better finish . . . Yet setup time and tooling costs are slashed dynamically. Motors up to 60 H.P. permit metal to be removed at a terrific rate.

The new H.E.B. PILOTE is the latest achievement of H. Ernault Batignolles — France's century-old machine tool builders and specialists for years in the design and manufacture of *copying lathes*!

If your plant is ready for H.E.B. "Push-button Turning" that makes present methods obsolete, then write, wire or telephone now for a demonstration or catalog!

# H·E·B

"THE WAY TO TURN"

## H. E. B. MACHINE TOOLS, INC.

475 FIFTH AVENUE • NEW YORK 17, N. Y.

TELEPHONE: LEXINGTON 2-0266

Certain exclusive sales territories are still open.

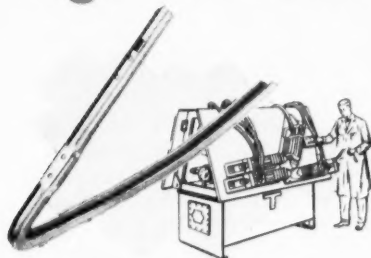
COPYING LATHES • ENGINE LATHES WITH COPYING ATTACHMENTS • TOOL ROOM LATHES • CARBIDE TOOL GRINDERS



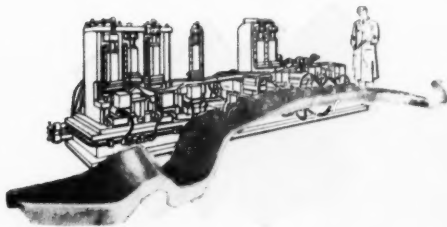
There are lots of ways to  
**PIERCE METALS**



But here's  
**High Production Piercing in a single set-up**



Seven irregular holes and two trimming operations complete this car door inner window frame in one setup. Model changes can be made at low cost.



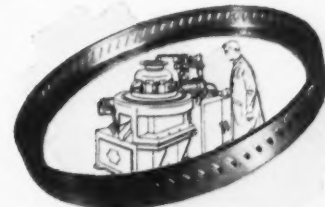
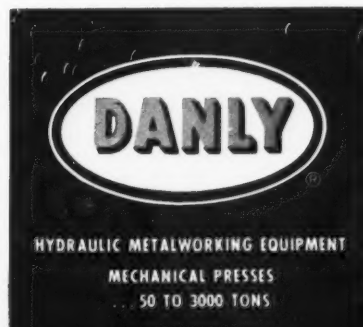
More than 40 holes in this automotive frame member are pierced simultaneously on a Danly machine built expressly for this purpose.

**DANLY HYDRAULIC METALWORKING EQUIPMENT**

Now you can pierce multiple holes of practically any type—round, oblong or irregular—to very close tolerances in a single setup. Capacity of Danly Metalworking Equipment can be as high as 225 tons per hole with break-through shock practically eliminated. Each station hydraulically strips its punch, greatly simplifying fixturing. Custom-built for your piece part, Danly Hydraulic Metalworking Equipment enables you to pierce more holes faster and more accurately—in one operation. Write for the special bulletin shown at right today.

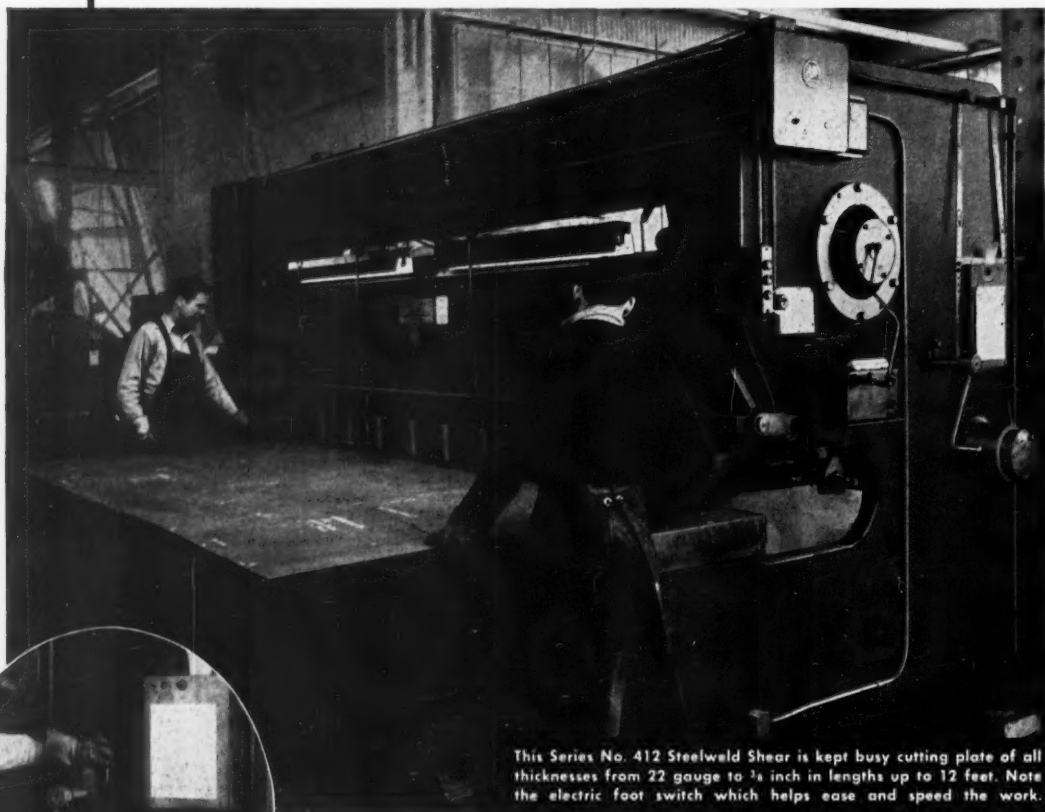
**DANLY MACHINE SPECIALTIES, INC.**

2100 South Laramie Avenue, Chicago 50, Illinois



Irregularly shaped holes are pierced in this stainless steel jet engine part to very close tolerances—automatically.

# KNIVES STAY SHARP LONGER for California Steelweld Shear User



This Series No. 412 Steelweld Shear is kept busy cutting plate of all thicknesses from 22 gauge to  $\frac{3}{4}$  inch in lengths up to 12 feet. Note the electric foot switch which helps ease and speed the work.

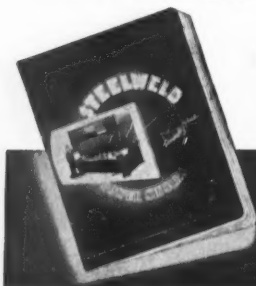


One of the big reasons why knives stay sharp longer on Steelweld Shears is the simplicity with which knife clearance can be adjusted for every plate thickness. It's merely a matter of turning a hand crank until the gauge pointer is on the proper figure. No bolts to loosen. No need of a feeler gauge.

"It's a shame," said the shop foreman at Stephens-Adamson Mfg. Co., Los Angeles, California, "but since installing our Steelweld Shear the knife-sharpening man has been crying because we have no work for him."

After months of continuous operation, eight hours a day, usually six days a week, inspection of cut pieces indicates the knives are practically as sharp as new. Parts cut have no burrs and are straight and true. Even when the cutting edges of the knives finally become dulled, there are three more cutting edges ready for use as all four corners of each knife are prepared for shearing.

Stephens-Adamson like their Steelweld Shear and are happy over its operation. It plays an important role in the manufacture of screens, elevators and conveyors which are the principal products of this large West-coast plant. In their words, it is "heavy, well built and dependable. We know it is reliable and always ready to handle our work from day to day."



## GET THIS BOOK!

CATALOG No. 2011 gives construction and engineering details. Profusely illustrated.

## THE CLEVELAND CRANE & ENGINEERING CO.

5417 East 282nd Street • Wickliffe, Ohio

# STEELWELD PIVOTED BLADE SHEARS

# Schrader presents a complete NEW LINE of 4-Way Valves



3320 F— $\frac{1}{4}$ "



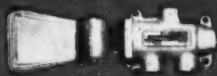
3320 H— $\frac{1}{4}$ "



3320 P— $\frac{1}{4}$ "



3320 S— $\frac{1}{4}$ "



3321 F— $\frac{3}{8}$ "



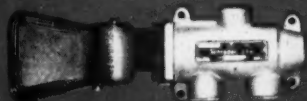
3321 H— $\frac{3}{8}$ "



3321 P— $\frac{3}{8}$ "



3321 S— $\frac{3}{8}$ "



3322 F— $\frac{1}{2}$ "



3322 H— $\frac{1}{2}$ "



3322 P— $\frac{1}{2}$ "



3322 S— $\frac{1}{2}$ "



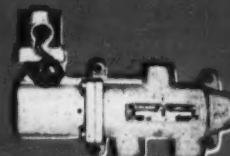
3323 F— $\frac{3}{4}$ "



3323 H— $\frac{3}{4}$ "



3323 P— $\frac{3}{4}$ "



3323 S— $\frac{3}{4}$ "

**FOOT OPERATED**  
Feature light foot action  
—can be operated all  
day without fatigue.

**HAND OPERATED**  
Feature light snap on  
and off action for fast,  
accurate control.

**PILOT OPERATED**  
Especially desirable for  
remote control applica-  
tions.

**SOLENOID OPERATED**  
Available for 110, 220  
or 440 volt AC.

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Please send me full details on your new line of 4-Way Valves.

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# NEW



*Lehigh*  
**PRO-TRACER®**

PROFILE-TRACING  
LATHE ATTACHMENT

FOR ENGINE OR  
TURRET LATHES

**MULTIPLE O.D.  
STEP TURNINGS**

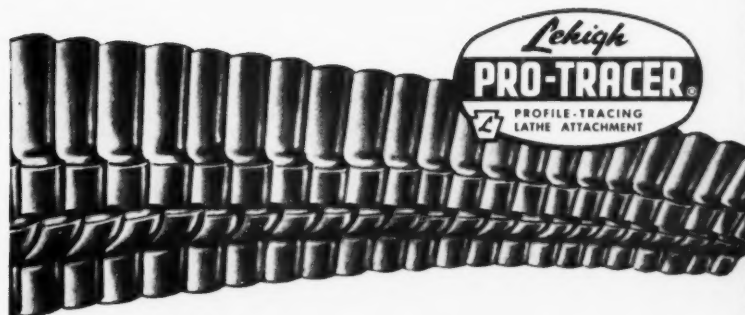
Turning 90° shoulders in the  
direction of the feed, or blend-  
ing a shoulder with a radius, is  
possible on either I.D. or O.D.  
turning.

**MAKES**

*precision duplicating*

**PRACTICAL and PROFITABLE**

**in any machine shop...**



## Use it for PROFITS— Use it for CONVENIENCE

Now any machine shop can do precision duplicating at low cost. No longer need orders for identical duplicates be farmed out or refused.

This completely new profile tracing attachment is rugged, compact and thoroughly shop-proved. Its extremely simple design makes it foolproof and trouble-free. Its versatility adapts it to many different applications and it will satisfactorily perform most of the operations of high-cost, complicated duplicating equipment.

### INSTALLED IN FIVE MINUTES

Installation or removal requires only a few minutes. No alterations to the lathe are necessary. Once set up, a lathe equipped with PRO-TRACER can be operated by semi-skilled labor. One operator can run a battery of them.

- **PRECISION BUILT** — tolerances as close as .0005 have been held.
- **INSTANT TOOL RETRACTION** — pre-loaded ball bearings also eliminate play and back lash.
- **WORK SIZE** — limited only by length of lathe.
- **TEMPLATES** — easily and inexpensively made from standard ground stock 1/8"x2".
- **SHORT OR LONG RUNS** — rugged enough for three-shift production. Ideal for runs too short for long-run equipment.

Write for fully descriptive folder.

**\$375** complete  
only

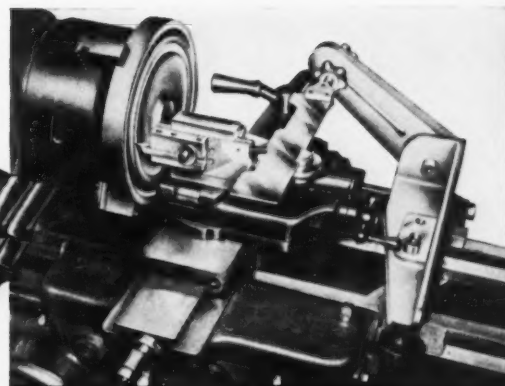
IN STURDY CARRY CASE FOR COMPACT STORAGE

AIR CONTROL  
DIVISION OF

**Lehigh**  
**FOUNDRIES, INC.**  
1507 LEHIGH DRIVE EASTON, PA.

Manufacturers of a complete line of  
**AIR VALVES • CYLINDERS • HOISTS**

Precision Castings • Automatic Vending Machines  
Commercial Refrigeration Systems and Units  
Profile Tracing Lathe Attachments



### QUICKLY SET UP FOR

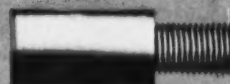
#### MULTIPLE FACINGS

By turning Lehigh PRO-TRACER at right angles to spindle, it can be used for profile facing.



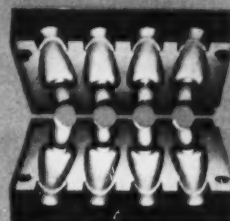
#### MULTIPLE O.D. TURNINGS

The Lehigh PRO-TRACER can be used for O.D. turning including tapers. It will make an .031 minimum radius and will turn an unlimited maximum radius.



#### MULTIPLE SHOULDER THREADINGS

Internal or external threadings, straight or tapered, can be made with Lehigh PRO-TRACER. Because of quick-retracting of cutting tool, thread can be cut close to a shoulder without danger of breaking tools.



#### MULTIPLE BORINGS

Boring and I.D. contours can be turned with Lehigh PRO-TRACER by same method as conventional O.D. turning. A 90° step can be cut in the direction of the feed.

# THE TURNING POINT



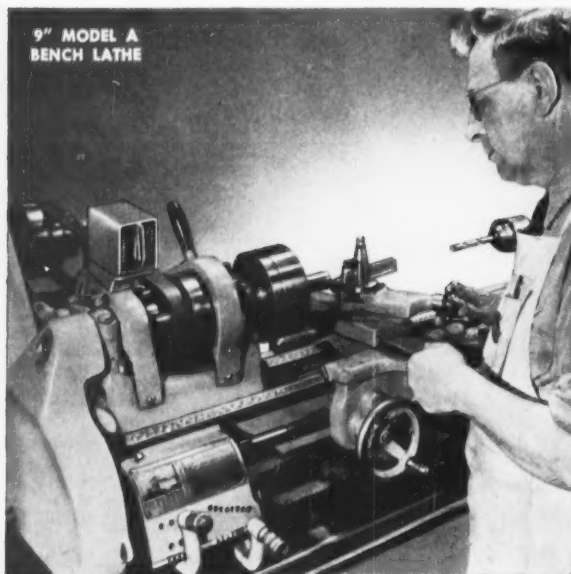
# FOR LOWER COSTS



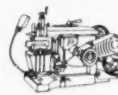
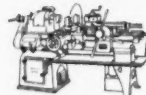
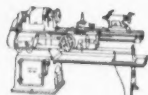
Your turning point for lower machining costs can readily be found in South Bend 9" Lathes. If you have small work requiring close tolerances you will find these lathes capable of handling it efficiently. Additional savings will also be made in original investment, power, tooling, maintenance and floor space. And their simple, easy operation is economical of operator effort.

You'll be surprised how busy you'll keep them day after day. Their versatility permits a wide range of operations on a large variety of jobs. And this adaptability involves only a minimum of down time and effort. An exceedingly large selection of practical attachments and tools is available to simplify tooling for both routine production and special operations.

There is a South Bend 9" Lathe for virtually every production, toolroom and maintenance need. They are made in Quick Change Gear, Toolroom, and Independent Change Gear models in both bench and floor types. Let your near-by South Bend distributor show you how these precision lathes can do you a "good turn." Or, send coupon for literature.



PLEASE SEND  
INFORMATION  
CHECKED:

☐


☐ TOOLS & ATTACHMENTS

☐ 9" and 10" BENCH LATHES

☐ 10" to 16-24" FLOOR LATHES

☐ DRILL PRESSES

☐ TOOL GRINDERS

☐ 1/2" & 1" Collet TURRET LATHES

☐ 7" BENCH SHAPERS

Name \_\_\_\_\_

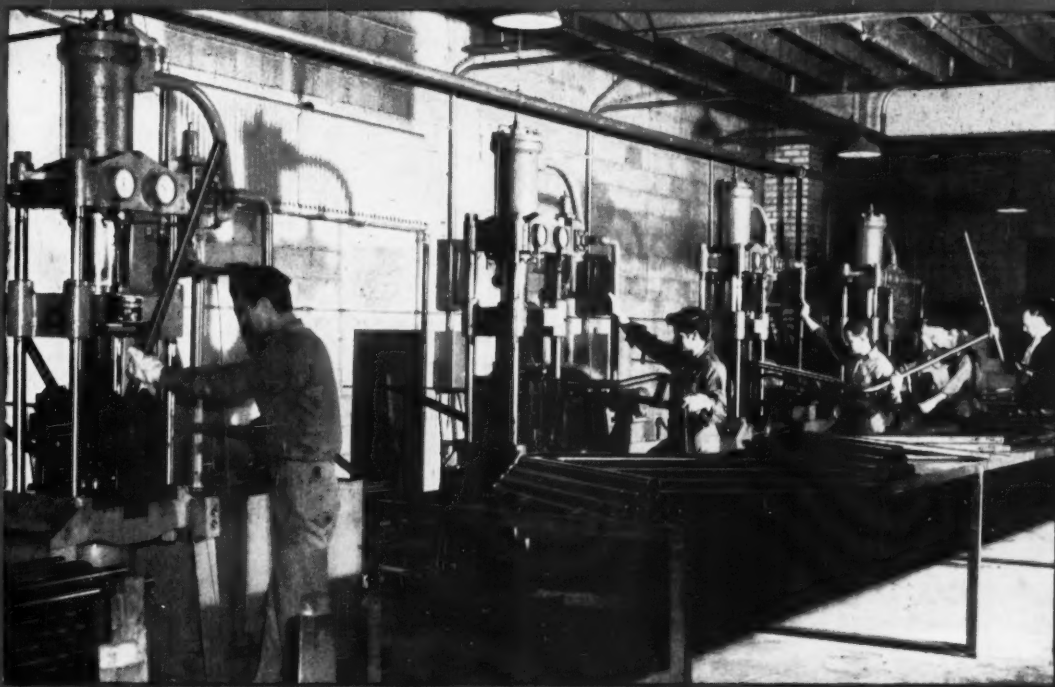
Company \_\_\_\_\_

Street \_\_\_\_\_

City & State \_\_\_\_\_

Building Better Tools Since 1906 • **SOUTH BEND LATHE** • South Bend 22, Indiana





## BENDING TUBING INTO TAILPIPES . . .



another job done better, faster  
on **ELMES** Hydraulic Presses!

Four 20-ton hydraulic tube benders—one of many types of Elmes Presses built for special metalworking jobs—are shown above in operation at James Steel and Tube Co., Hazel Park, Michigan. Automobile tailpipes, each requiring seven bends, are produced at the rate of 2000 complete units per eight-hour shift.

These small but heavy-duty, high production Elmes Presses are designed especially for bending tubing into automotive exhaust and tailpipes. Their performance has been so outstanding—affording substantial savings

in time, effort, maintenance and money—that they are now widely recognized as the logical "first choice" among presses used for this application.

Whether your metalworking press requirements call for special purpose designs, or can be met with standard production equipment, you'll find it always pays to "put your pressing problems up to Elmes." Many others have found it profitable . . . in terms of gaining *press performance at its best!* Ask Elmes engineers to assist you. Recommendations and cost estimates supplied promptly.

American Steel Foundries

### ELMES ENGINEERING DIVISION

1162 TENNESSEE AVENUE CINCINNATI 29, OHIO

DISTRIBUTORS IN PRINCIPAL INDUSTRIAL CENTERS — ALSO MANUFACTURED IN CANADA

METAL-WORKING PRESSES • PLASTIC-MOLDING PRESSES • EXTRUSION PRESSES PUMPS • ACCUMULATORS • VALVES • ACCESSORIES



ABRASIVE No. 3B  
POWER FEED  
SURFACE GRINDER

the  
carefully  
built grinder



## CAREFUL... GRINDER AT WORK!

Good machines are the surest step toward quality output . . . and there's no machine tool that's more careful with your work than the ABRASIVE 3B Surface Grinder.

Thousands of Abrasive 3B Surface Grinders are in use in automotive, airplane engine, and tool plants throughout this country and abroad. Find out for yourself how this fast, accurate surface grinder—with its power table traverse and cross feeds—can help in your plant. Write for descriptive catalog. Abrasive Machine Tool Company, 12 Dunellen Road, East Providence 14, R. I.

**ABRASIVE**

ACCURACY BOOSTS PRODUCTION

*Abrasive Quality Is Reflected in the Finish of Your Product*

# Facts you should know about Kearney & Trecker's Special Machinery Division

► If you're a potential buyer of special machines or special tooling — read about our expanded facilities

**T**HOUGH we've been designing and building standard and special machine tools since 1898, limited production facilities for special machines previously prevented us from offering these services on a wide scale.

But now, our Special Machinery Division has new and greatly expanded facilities. Its exclusive job will be to build special machine tools and tooling or specially to adapt standard equipment to solve specific metalworking problems.

## Check our qualifications:

**EXPERIENCE:** We've been in the business 55 years. In addition to being one of the country's leading producers of standard milling machines . . . *our production of special machinery has ranged up to \$3,000,000 annually.*

**FACILITIES:** The new Special Machinery Division plant, built on a 38-acre site, is equipped with more than *\$2,500,000 worth of new tools and equipment.*

**PERSONNEL:** The Special Machinery Division engineering section has nearly 100 experienced design and production engineers at its command. These men specialize in applying to metalworking the latest developments in mechanics, hydraulics, electronics, metallurgy and allied fields. In addition, it has a full complement of experienced machinists and mechanics needed for special machine construction.

**PERFORMANCE:** Kearney & Trecker's Special Machinery Division is best recommended by its record of successfully solving hundreds of unusual machining problems. These include high production requirements as well as exacting dimensional accuracies and surface finishes.

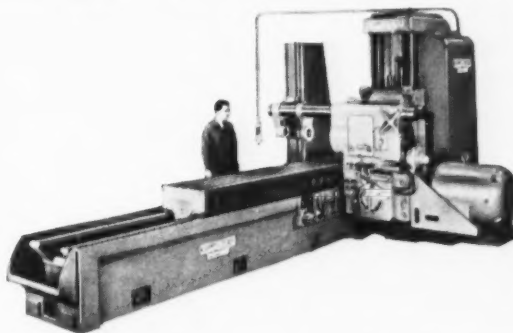
**RESPONSIBILITY:** Our Special Machinery Division is an integral part of the Kearney & Trecker Corporation . . . and is fully supported by all its financial, physical and personnel resources.

Any commitment for a product of this division is a commitment that fully involves the accepted reputation for responsibility and satisfaction that is Kearney & Trecker's.

## We invite your inquiry

We'll be glad to provide you with any information we can . . . including sample machine specification sheets on typical installations, a brochure covering the expanded facilities of our Special Machinery Division, and details on our Customer Engineering Service. Furthermore, if you have special production machinery problems, have one of our senior Project Engineers analyze them, without obligation, of course.

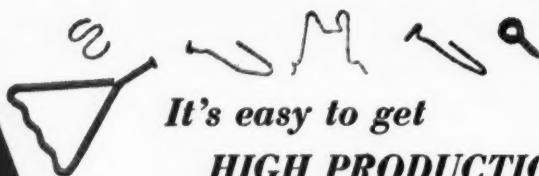
Write, wire or phone the Special Machinery Division, Kearney & Trecker Corp., 6784 W. National Ave., Milwaukee 14, Wisconsin.



We've built special machines or adaptations of standard equipment for practically every industry. Here is a photo of a 50 hp CSM Simplex milling machine we designed and built for a leading manufacturer.



**NILSON  
FOUR-  
SLIDE**



*It's easy to get  
**HIGH PRODUCTION**  
... and **UNIFORMITY**, too!*

## Wire and Ribbon Metal FORMING MACHINES



**U**NIFORMITY in automatic production doesn't come by chance! In the case of wire and ribbon stock forming on **NILSON 4-SLIDES**, it means control of the material from the coil to the final form.

Parts, such as illustrated, are produced to tolerances of .002 at critical dimensions. Dies and forming tools, once installed (faster and simpler with **NILSON'S** open construction) maintain close tolerances for short and long runs. One machine! One set-up! Increased production! Maximum uniformity!

Model SF3 **NILSON 4-SLIDE**, shown above, with No. 51B Tilting Stock Reel, is a complete unit that can be set-up in any convenient location.

### Range of sizes

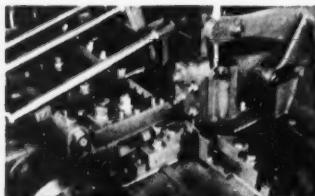
#### Wire Forming —

1/32" through 1/2" wire. Feeds up to 32'.

#### Ribbon Stock Forming —

1/32" through 3 1/2" wide material. Capacity of press section 5 to 30 tons; 50 to 75 tons in heavy duty types.

**For specific  
recommendations  
— send details of  
your operation.**



Close-up of the **NILSON** forming section with the built-in Horizontal Press to the left. This design eliminates secondary handling and insures product uniformity because the sequence of stamping and forming is automatically controlled.



Close-up of the **NILSON** feed mechanism... capable of feeding wire and ribbon metal to tolerances of .001. Another important element in insuring product uniformity. Positive control is maintained over the material regardless the length of feed.

THERE'S NOTHING LIKE A  
**NILSON**

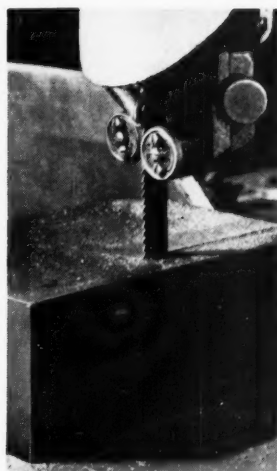
NILSON has been specializing in  
Forming Equipment for over 50 years.

**THE A. H. NILSON MACHINE COMPANY**  
1518 Railroad Avenue • Bridgeport 5, Connecticut  
CHICAGO • CLEVELAND • DETROIT • LOS ANGELES • HAMILTON, ONT., CANADA

Automatic Chain Making Machines • Automatic Staple Forming Machines • Wire and  
Stock Reels • Foot Presses • Wire Straightening Equipment • Slide Feeds for Presses

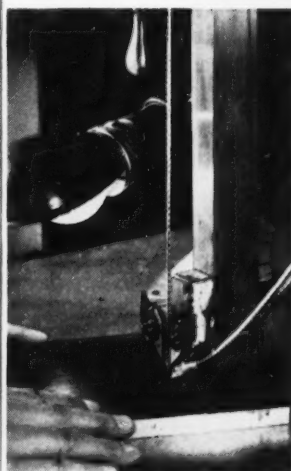
• Pick the Top  
**"NAME  
 BAND"**

for all these  
**Metal-Sawing  
 Jobs**



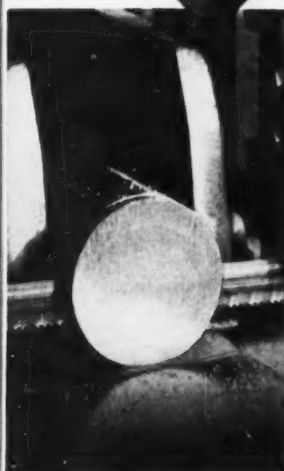
**For Heavy  
 Production  
 Cutting**

You'll like this rugged, break-resistant standard tooth blade for trimming gates and risers off castings, cutting metal bars and other tough production work. Hardened along the tooth edge only, it cuts fast, stays sharp, gives a longer run for your money! All standard widths and tooth spacings. Furnished in 100' and 300' coils or welded to length for specific machines.



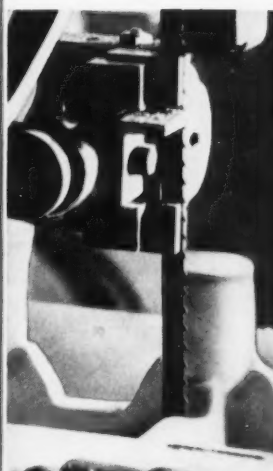
**For Contour  
 Cutting and  
 Die Making**

In the narrower widths, this edge-holding, smooth cutting blade is an outstanding favorite for contour work. Because the teeth are set with absolute evenness on both sides of the blade, you can depend on straight, on-the-line cuts with no "leading." All standard widths and tooth spacings furnished in 100' and 300' coils or welded to specified length.



**For  
 Horizontal  
 Cut-Off Work**

Furnished either Regular or Wavy Set in the wider widths, this Simonds-made standard tooth blade easily handles the wide variety of cutting required in general shop and steel warehouse operation. All sizes come in 100' and 300' coils or welded to length.



**For Cutting  
 Soft Materials**

This Skip-Tooth Hard Edge Blade has extra gullet capacity with maximum blade strength . . . gives fast, trouble-free service in cutting aluminum, magnesium, plastics, plywood and hardwood. All standard sizes available in 100' and 300' coils or welded to length for specific machines.

Get Delivery From Stock From Your Industrial Supply Distributor



Factory Branches in Boston, Chicago, San Francisco and Portland, Oregon.  
 Canadian Factory in Montreal, Que. • Simonds Divisions: Simonds Steel Mill, Lockport, N. Y.;  
 Simonds Abrasive Co., Phila., Pa. and Arvida, Que., Canada

For more information on products advertised, use Inquiry Card, page 239

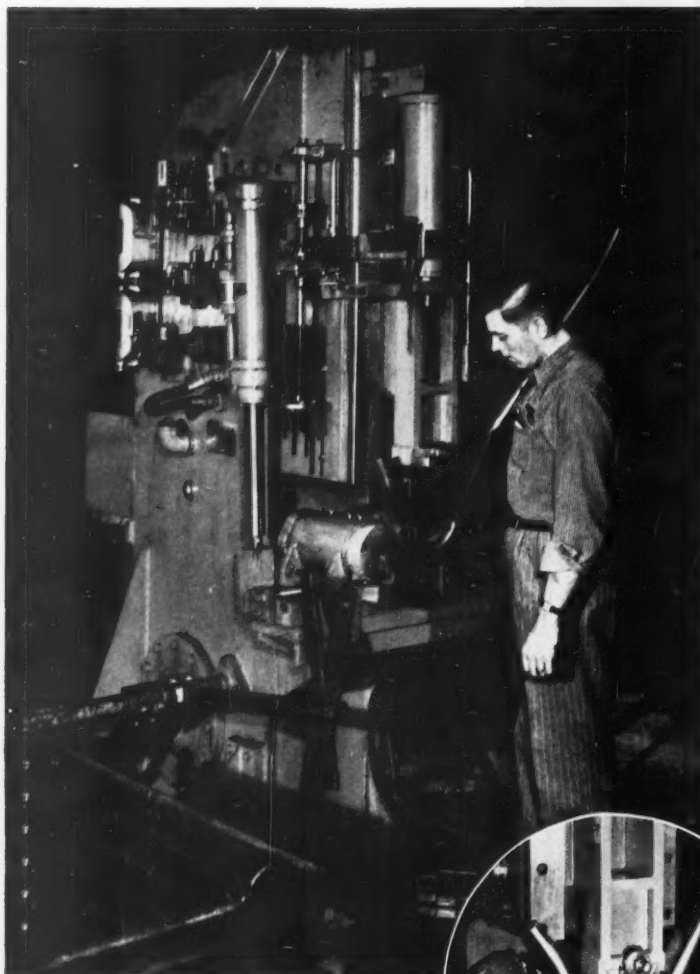
MACHINERY, September, 1953—289



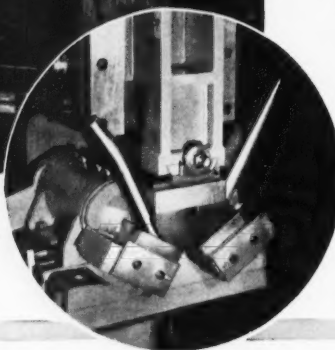
# New PINES 20-TON BENDING PRESS

## PRODUCES AUTOMOTIVE EXHAUST PIPES

**50%  
FASTER**



▲ Production view of new Hydraulic Bending Press. Note angle-of-bend selector, side-mounted die cushion, panel-mounted valves, and oil cooler.



◀ Closeup view of Pines Bending Press forming 4th bend in a 1 1/2" (16 ga.) CRS automotive exhaust pipe. Note how wing dies are controlled by side-mounted cushions through heavy crank arms. Interchangeable pick-off turret of angle-of-bend selector saves setup time on repeat jobs.

### CHECK THESE COST-CUTTING PRODUCTION FEATURES

- ✓ **Twin Equalizing Side-Mounted Cushions** — provide greater working clearance, maintain constant torque, reduce flattening and distortion.
- ✓ **Faster Cycling** — angle-of-bend selector indexes and resets to starting position automatically without indexing through idle stations, increases output.
- ✓ **Greater Work Handling Capacity** — extra clearance reduces number of setups on multiple bending, permits broader use of uniform radii, cuts tooling and production costs.
- ✓ **Interchangeable Pick-Off Turret** — for angle-of-bend control. Permits storing and remounting for repetitive jobs, reduces setup time.
- ✓ **Adjustable Ram Speed Control** — assures efficient operation, simplifies setups. Ram can be lowered slowly or stopped at any point.

#### WRITE FOR NEW 4-PAGE BULLETIN

Write today for free bulletin completely illustrating and describing the new Pines Bending Press and its cost-cutting production features.



**PINES** ENGINEERING CO., INC.

Specialists in Tube Fabricating Machinery 686 WALNUT • AURORA, ILLINOIS

PRODUCTION BENDING • DEBURRING • CHAMFERING MACHINERY

Specialists in Designing and Producing Carbide Cutting Tools

**WESSON** BAND  
TYPE

## TOOL HOLDERS

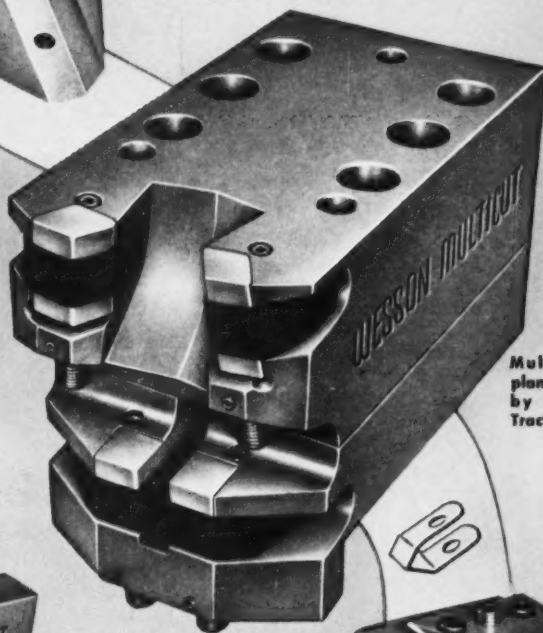
Special and Standard

with replaceable bands  
at low cost.

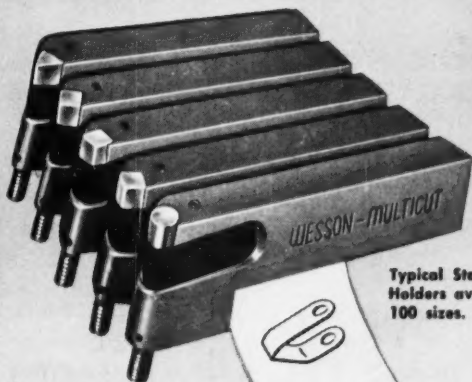


Grooving tool used  
on the Cadillac Tank.

**ALL THE WEAR ON  
THE BAND MEANS  
EXTRA ECONOMY, EXTRA  
EFFICIENCY, HOWEVER  
SIMPLE OR COMPLICATED  
YOUR TOOL HOLDER  
PROBLEM!**

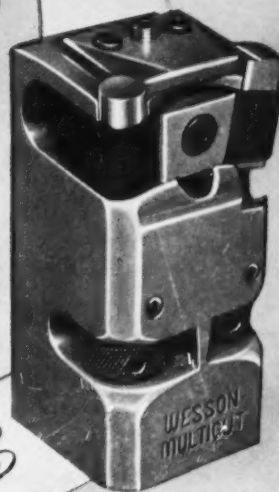


Multiple insert  
planer tool used  
by Caterpillar  
Tractor.



Typical Standard Wesson Tool  
Holders available in 10 styles,  
100 sizes.

2 insert tool for turn-  
ing Ford-Lincoln rear  
axle shaft on a Bul-  
lard Man-au-trol.

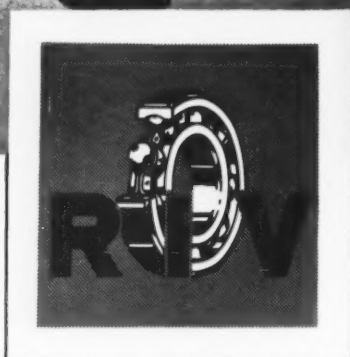
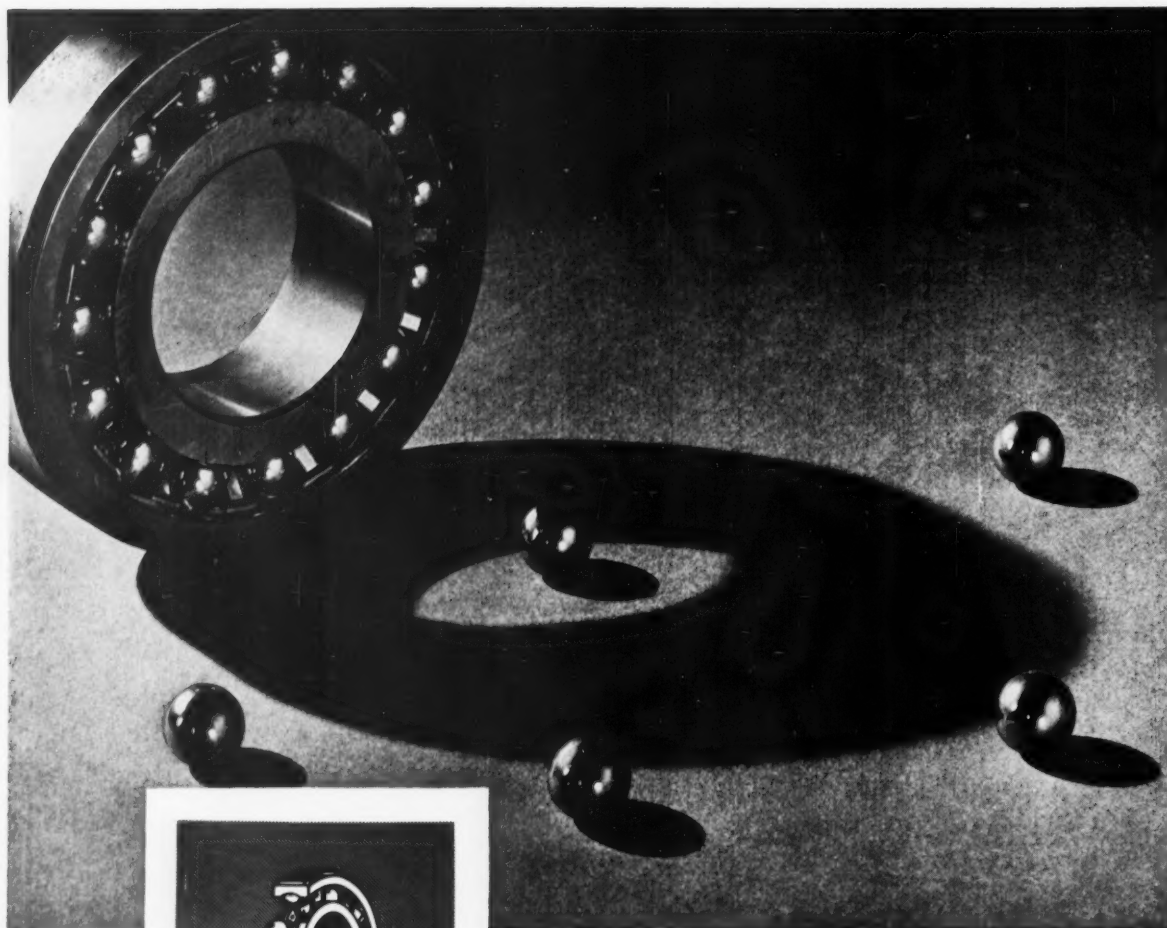


**WESSON**  
*Carbide Cutting Tools*

First choice when tough metals are to be cut—  
for special or standard purposes—  
for single or multiple set-ups.

**WESSON COMPANY** 1220 Woodward Heights Boulevard  
FERNDALE (DETROIT 20) MICHIGAN

Affiliated with WESSON METAL CORPORATION, Lexington 34, Kentucky



**RIV - OFFICINE DI VILLAR PEROSA**  
S.p.A. TURIN (ITALY)

**ESTABLISHED IN 1906:** almost 30 years of steady development are a guaranty of wide engineering experience.

**3 FACTORIES:** at Turin, Villar Perosa, Aponso, covering altogether an area of 200 000 square meters, constitute an industrial group of high productive possibilities.

**100 ENGINEERS:** place their technical knowledge and practical experience at the service of every customer.

**1500 OFFICE WORKERS:** make up an efficient commercial and administrative organization.

**9000 WORKMEN:** contribute their labor and skill to an ever improving and increasing production.

**8000 MACHINE TOOLS:** mean an industrial capacity of world importance.

**CONTROLS AND INSPECTIONS:** carried out at every manufacturing stage ensure an exact conformity of parts to constructional tolerances.

**RIV** manufacture: Single-row Radial Ball Bearings • Double-row Radial Ball Bearings • Self-aligning Radial Ball Bearings • Single-row Angular-contact Ball Bearings • Double-row Angular-contact Ball Bearings • Cylindrical Roller Bearings • Single-row Barrel-shaped Roller Bearings • Double-row Barrel-shaped Roller Bearings • Needle Roller Bearings • Taper Roller Bearings • Single-thrust Ball Bearings • Double-thrust Ball Bearings • Thrust Barrel-shaped Roller Bearings • Shielded Bearings • Sealed Bearings • Balls, Rollers and Needle Rollers • Pillow Blocks • Tram- and Railway Journal Axle-boxes • Journal Axle-boxes for Small Wagons • All types of special bearings, in every size (metric and inch dimensions), with outside diameters ranging from 10 mm to over 4 meters, for every application.

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|---|--|---|
|  | <p><b>C &amp; C SALES CORPORATION</b><br/>SOLE IMPORTERS FOR UNITED STATES AND CANADA<br/><small>1000 Broadway, New York</small></p> |  |
| 1775 BROADWAY   | NEW YORK 19, N. Y.   |   |

FOR THE MILLING OF  
NON-FERROUS METALS IT'S

**Onsrud**

HI-FEED HI-SPINDLE-SPEED  
MACHINES

from automatic pilots



to automatic washers



you can cut costs in

aluminum parts milling

with **Onsrud** HI-SPEED MACHINES

When aluminum parts must be production milled, you'll find there's an Onsrud hi-speed milling machine that can do the job faster, better and at far less cost. Once Onsrud machines were used primarily by aircraft manufacturers. Today sub-contracting plants by the score are finding out for the first time what high speed aluminum milling can really be with Onsrud machines.

**WHAT IS HI-SPEED?** . . . With Onsrud milling machines it means direct drive cutter motors from 5 to 100 HP, cutters turning at speeds of 3,600 to 20,000 RPM, and operations being made automatically under template or profile bar control. These are a few of the key points in Onsrud machine design. Write for complete information.

Your inquiry for bulletins is invited. Write for Radial Arm Milling Machine Bulletin . . . A-24 Milling Machines Bulletin 1139 . . . A-72 InvOmil Bulletin 1140 . . . and A-80 Automatic Contour Mill (not shown) Bulletin.

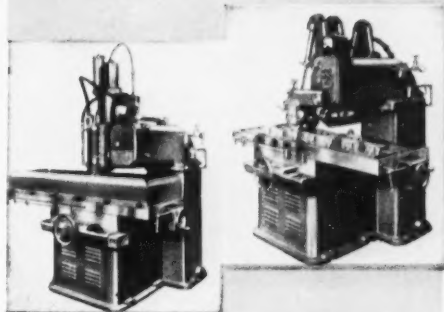
**ONSRUD MACHINE WORKS, INC.**

3940 Palmer Street

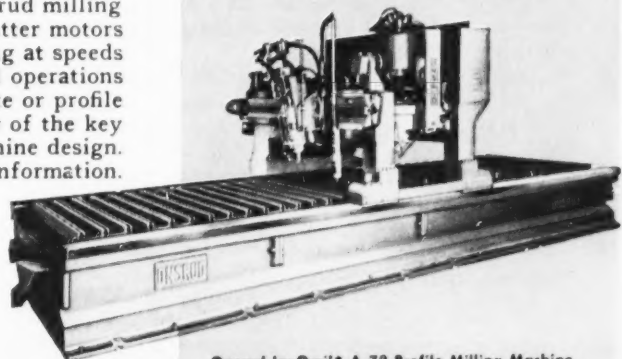
Chicago 47, Illinois



Onsrud Radial Arm Milling Machine (or router) . . . for cut-out or profile milling of flat sheets.



Onsrud A-24 Horizontal and Vertical Milling Machines. For general high speed milling.



Onsrud InvOmil\* A-72 Profile Milling Machine. The most unusual machine in metalworking. Up to 500% faster. For high speed, heavy duty profile and taper milling and related operations.

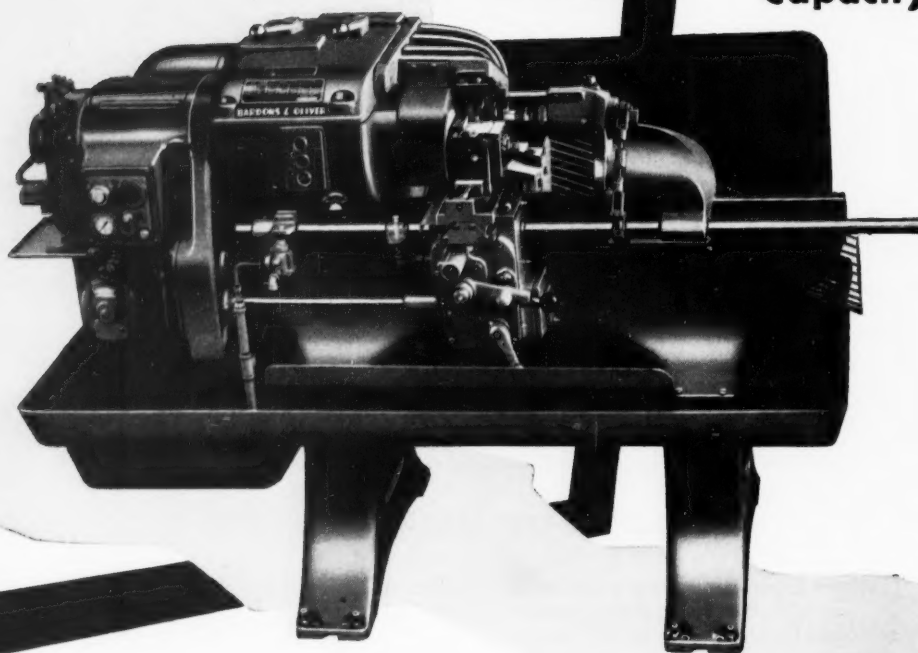
\*Trade Mark of Onsrud Machine Works, Inc.



*Improved...*

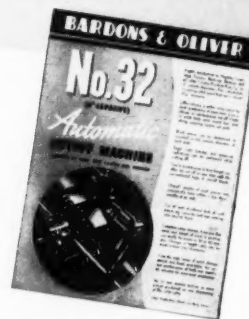
**BARDONS & OLIVER  
MODEL NO. 32  
AUTOMATIC  
CUTTING-OFF LATHE**

**2"  
Capacity**



Increased Rigidity and Sturdiness of the entire tool feeding mechanism results in more continuous production and assures a longer, accurate life of the machine.

The machine is capable of over 100 cycles per minute . . . its production *AVERAGE* is 30,000 pieces in an 8 hour day. Highly productive for nipples, couplings, ferrules, bushings, spacers, and all other tubular products.



Write us on your company's letterhead for this new Catalog.

**BARDONS & OLIVER, INC.**

1135 WEST 9TH STREET

• CLEVELAND 13, OHIO

**LOGAN FLUID POWER • DURABLE, DEPENDABLE SINCE 1916**



Igussu Falls, Brazil . . . as seen from the Argentine side. Drops 237 feet. Water swirls down over an arc 2½ miles wide resulting in a breathtaking color display of every conceivable pastel hue.

## LOGAN <sup>AIR-DRAULIC®</sup> FEED-CONTROLLED CYLINDERS

POWER MOVEMENTS IN ANY DIRECTION — NO POWER UNIT REQUIRED

COMBINES

the fast-acting, economical  
low pressure operation of

**AIR**

with the smooth, uniform  
controlled regulation of

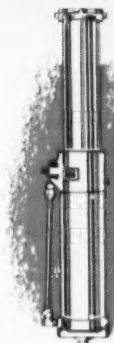
**OIL**

**5**

STANDARD  
MOUNTING TYPES

Standard bores from 3" to 8".  
Any stroke to 5 feet. For air  
pressures to 150 p.s.i.

Furnished for controlled feed with rapid  
return in either direction, or with controlled  
feed in both directions. Skip-  
feed movement can also be provided.



Air-Draulic Cylinder  
with Flange Mounting  
at Rod End

LOGAN MANUFACTURES 6,975 STANDARD CATALOGED ITEMS  
FREE CATALOG ON REQUEST



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**LOGANSPORT MACHINE CO., INC., 810 CENTER AVE., LOGANSPORT, IND.**

**look...**

any one of these  
24 punches and dies

**READY FOR USE IN 5 SECONDS**

*without set-up!*

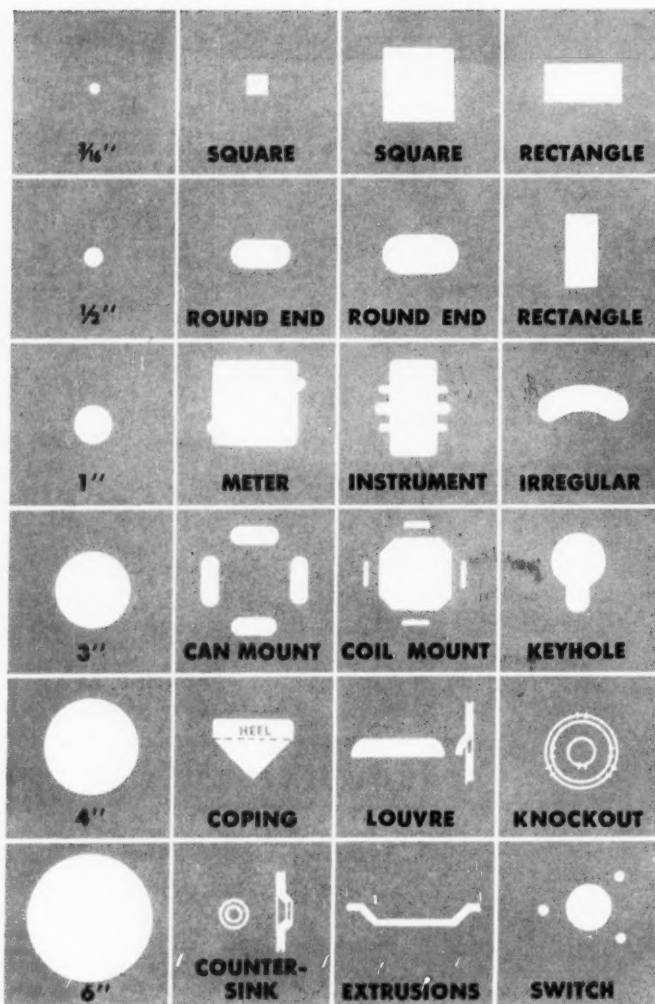
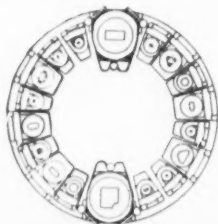
- Or, any selection of 12 to 32 punches and dies suited for your work.
- A Wiedemann Turret Punch Press has the tools where you want them—in the press—not on the shelf.
- In 5 seconds the operator selects the punch and die, and pierces the opening in flat sheet metal or plate.
- Any punch and die in the turret can be replaced with other sizes in less than 2 minutes.

**WITH A WIEDEMANN YOU CAN  
SAVE 60% TO 90% ON SMALL LOT PIERCING  
because you**

**Eliminate Set-up  
Eliminate Layout with Wiedemann Work  
Locating Gauges  
Reduce Handling Time**

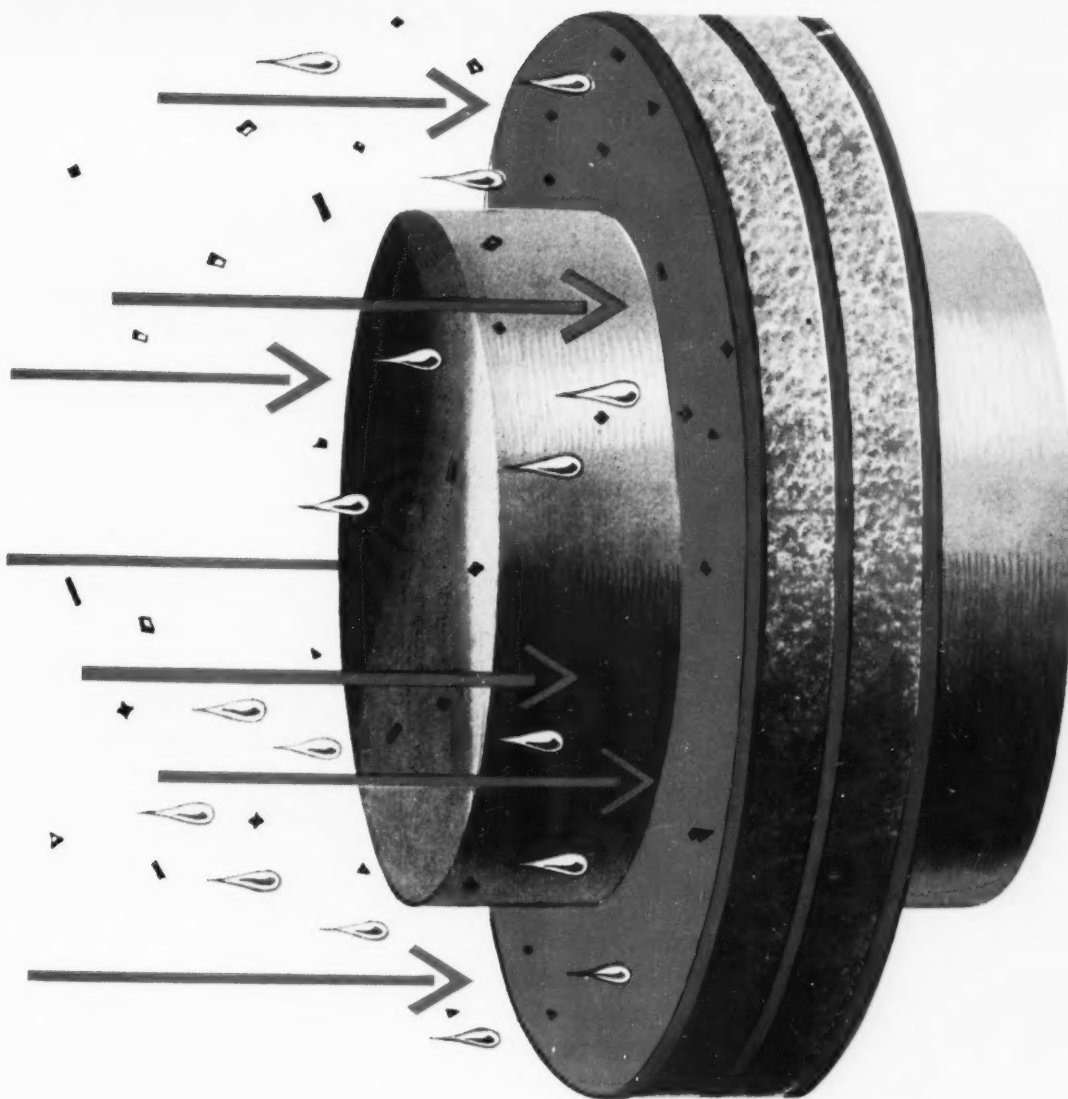
*We will make time studies on your work without obligation. Send prints.*

*Plan view of lower  
turret of typical  
Wiedemann with  
18 stations.*



**WIEDEMANN MACHINE COMPANY**

4205 Wissahickon Ave., Philadelphia 32, Pa.



## "WORK CLOTHES" SOLVE TOUGH SEALING PROBLEMS



GENERAL OFFICES: 68 GLENVILLE ROAD, GLENVILLE, CONN.

SALES OFFICES: New York, Boston, Chicago, Detroit, Cleveland, Rochester, Philadelphia, St. Louis, Atlanta, Dallas, San Francisco, Los Angeles, Portland, Seattle, San Diego, Montreal — PLANTS: Glenville, Conn.; Franklin, Mass.; Newburgh, N. Y.; Detroit, Mich.; Westerly, R. I. — ENGINEERING AND RESEARCH LABORATORIES: Glenville, Conn.

Seal off your sealing worries with felt "work clothes!" Above is an OilFoil seal, used as protective "work clothes" in many machines. It consists of two layers of felt, bonded with three septums of Hycar, the synthetic rubber-like substance that is impervious to and unaffected by oils, greases and the hydrocarbons used in hydraulic systems. Such washers can have one, two, or three septums, to keep fluids in and seal out water, dust, dirt, gases, and retain pressures. If there is no enclosed lubricant, the felt can be impregnated with oil or grease, to provide long-time lubrication. OilFoil seals are supplied cut to exact dimensions, ready for assembly. For more information, write for Data Sheet No. 11, "Felt Seals, Their Design and Application."



**NO GETTING AROUND IT!**

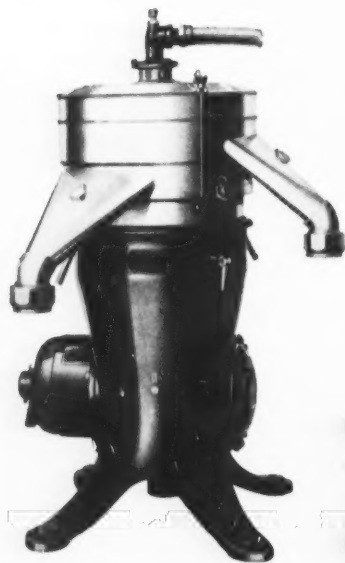


## **RUN-IN TESTS ARE MORE ACCURATE WHEN THE OIL IS CENTRIFUGED**

When factory oils are purified by means of a De Laval Centrifugal Oil Purifier, impurities and water are instantaneously removed. The oil can be used safely over and over again.

Equally important is the effect on the tools and on the work. De Laval purification of cutting oil, for example, greatly increases tool life, reduces machine "down time" and insures more consistently accurate work.

Hydraulic oil, slushing oil, honing oil, parts washing solution and general lubricating oil are among the factory oils that can be purified profitably by De Laval centrifugal machines.



**THE DE LAVAL SEPARATOR COMPANY**  
Chicago    Poughkeepsie, N.Y.    San Francisco

# *De Laval*



**PURIFIERS AND CLARIFIERS  
FOR FACTORY OILS**

# FOR THOSE TOUGH Special JOBS ...DEPEND ON National Tool Co.

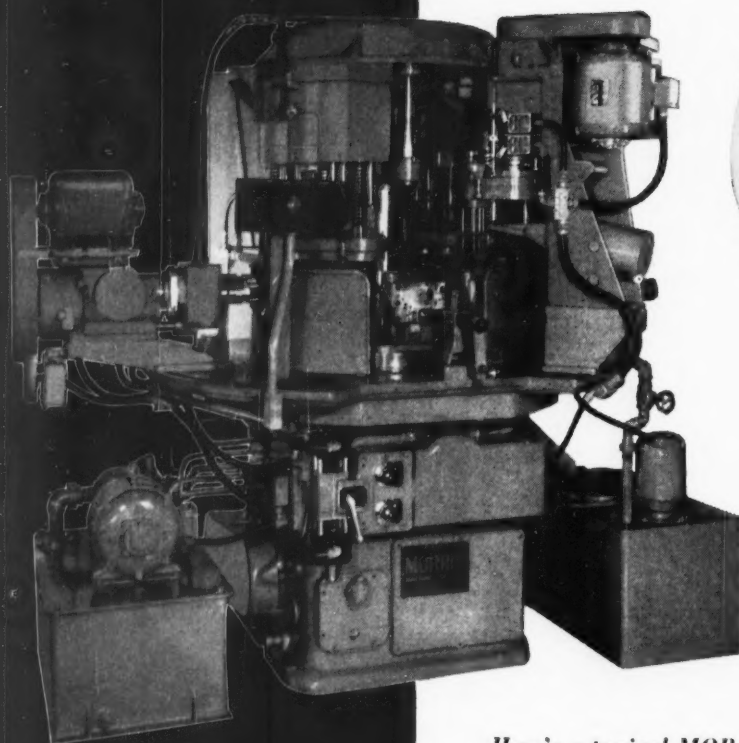


● Years of successful experience in *special* tooling and related production problems are yours for the asking. When the job requires *special* cutting tools call in your National Tool Co. representative. He is backed by more than 46 years experience in the engineering and manufacture of *special* cutting tools. His assistance is yours, without obligation, whether you're interested in one tool or a complete tooling program.

*Since 1905* engineers and manufacturers of high-quality special cutting tools for the metal-working industry

NATIONAL  
Tools  
CLEVELAND  
**National**  
**TOOL CO.**  
Cleveland 2, Ohio

**how little does it cost...**



Producing 170 finished transmission control valve bodies per hour at 100% efficiency, this machine performs 32 drilling and tapping operations in two cycles.

**to get  
"special  
machine"  
production  
with  
combination  
standard  
units?**

*Here's a typical MOR-SPEED answer to an ever-more important problem:*

A combination of Morris standard units . . . center column, base, indexing mechanism and hydraulic units . . . plus a made-to-order vertical and auxiliary side heads . . . make up this high production machine. Cost is less, delivery faster . . . the user gets the accuracy and low cost production of a "special" without the usual sky-high costs and limited application of conventional units.

Consider the multiple savings . . . investment, labor, time and floor space . . . of MOR-SPEED multiple machining. Let Morris Engineers prove that high production and precision can be yours for less than you might imagine.

a better product  
at less cost  
with precision  
- plus production



*Morris*

**THE MORRIS MACHINE TOOL CO.**  
946 HARRIET ST., CINCINNATI 3, OHIO



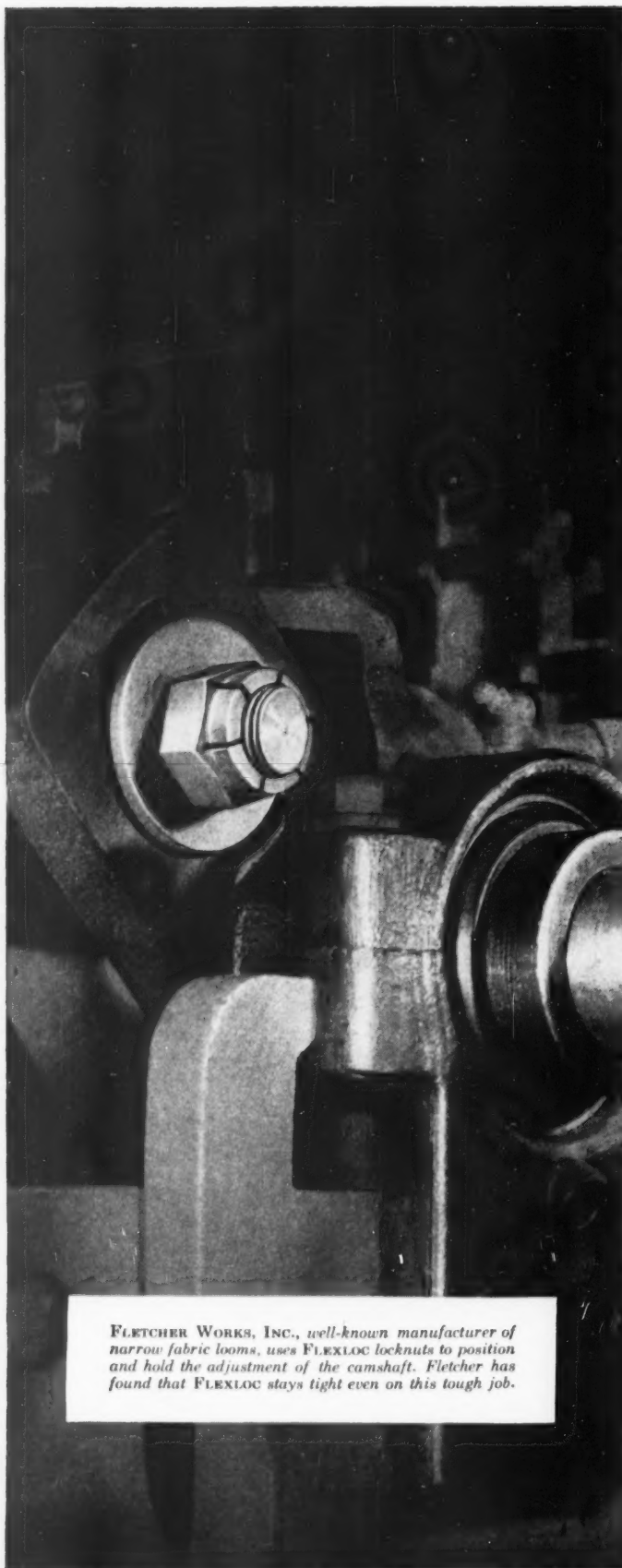
*Special Tools of Quality  
Engineered to Save Your Time*

**DETROIT REAMER & TOOL CO.**

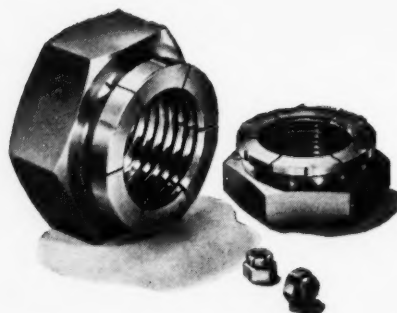
2830 E. SEVEN MILE ROAD • DETROIT 34, MICH.







FLETCHER WORKS, INC., well-known manufacturer of narrow fabric looms, uses FLEXLOC locknuts to position and hold the adjustment of the camshaft. Fletcher has found that FLEXLOC stays tight even on this tough job.



## How FLEXLOC locknuts reduce maintenance

FLEXLOCs reduce maintenance by staying where you put them. Once they are installed, you can forget them. Service and inspection periods can be stretched safely from days to weeks.

And FLEXLOCs eliminate complicated, time-consuming methods of locking threaded fasteners. They offer faster, simpler application, and safer, more dependable locking than plain nuts and lockwashers, castellated nuts and cotter pins, or nuts and jam nuts.

Use FLEXLOCs wherever you use an ordinary nut. These one piece, all metal locknuts—with nothing to assemble, come apart, lose or forget—won't work loose regardless of the vibration encountered. Yet they can be easily removed and used over and over again. FLEXLOCs are stop and lock nuts too. They don't have to seat to lock, and they stay put anywhere on a threaded member as soon as the locking threads are fully engaged.

You can get FLEXLOCs in a wide range of sizes in any quantity. Stocks are carried by leading industrial distributors everywhere. Write for literature and samples. SPS, Jenkintown 19, Pa.

**FLEXLOC**

LOCKNUT DIVISION

**SPS**

JENKINTOWN PENNSYLVANIA

*Our Fiftieth Year* : A START FOR THE FUTURE

*"We make sure that  
there is* **NO RUST** *on these expensive dies*

*—we use* **GULF NO-RUST**

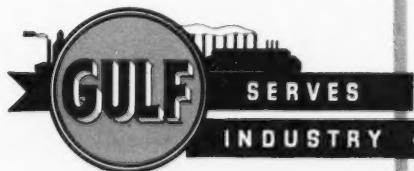


says Mr. R. P. Folland, Vice-President,  
Monarch Products Co., Hazel Park, Mich.

Application of Gulf No-Rust C (polar type) to three-stage 22-station progressive die, which lances, forms ears, pierces, and forms anchors on automobile parts in one stroke of the press.

"We can't take a chance on rust spoiling the surfaces of expensive dies like these, which cost in the neighborhood of \$20,000," says Mr. Folland. "That's why we spray them with Gulf No-Rust C. It not only gives good protection but also displaces any moisture which may already be present on the surface of the dies."

For additional information on Gulf No-Rust C (polar type) or on any of the complete line of quality Gulf rust preventives, send the coupon below.



Gulf Oil Corporation • Gulf Refining Company M  
1934 Gulf Building, Pittsburgh 30, Pa.

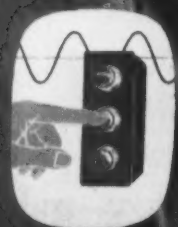
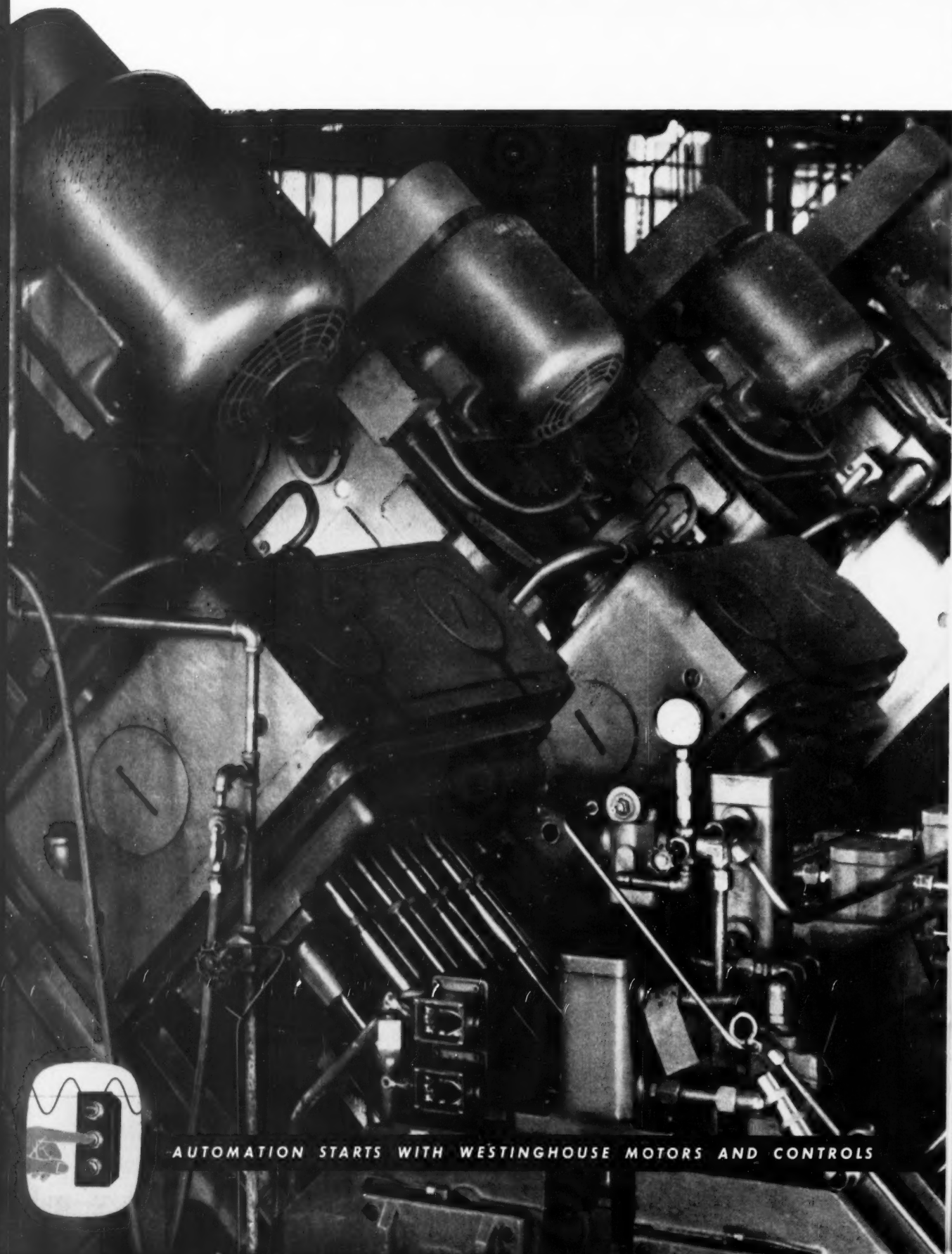
Please send me, without obligation, a copy of your pamphlet,  
"Gulf Rust Preventives."

Name .....

Company .....

Title .....

Address .....



AUTOMATION STARTS WITH WESTINGHOUSE MOTORS AND CONTROLS

# How to keep a production line humming at peak capacity

You can't hear the steady hum, but if you could, you would say, "There's a well-built production line." The line just keeps on running, keeps on machining. It wasn't always that way, but it has been ever since Westinghouse Motors and Controls were installed back in 1950.

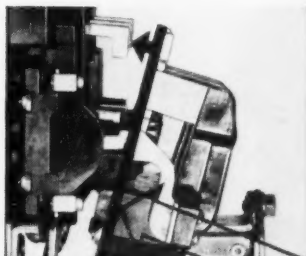
You see, when you standardize on Westinghouse Life-Line\* Motors and Controls, you're installing the kind of horsepower that really increases output per man. For example, there's no down time for motor lubrication. Life-Line motors are pre-lubricated and sealed for life at the factory. Also, you don't need to worry about starters sticking. Life-Line Starters have an advanced clapper design that depends on a positive spring action instead of gravity. They can't stick or jam.

\*Trade Mark

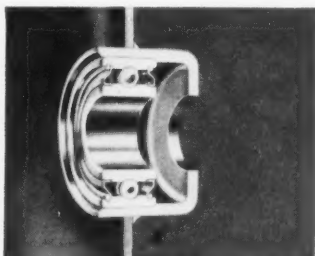
Remember, too, that Life-Line Starters give you permanent overload protection. A bimetallic snap-action, disc-type overload relay provides foolproof operation. It never loses its accurate factory calibration. And special insulation gives Life-Line motors maximum dielectric strength... enables them to resist moisture and mild chemicals.

## Get these free moneysaving facts

*101 Life-Line Case Histories*, B-4769, tells how 101 other manufacturers have used Life-Line motors to keep production humming at peak capacity. After you read how, see how from the movie, *Life-Line Speaks for Itself*. Phone your Westinghouse representative for this vital information, or write to: Westinghouse Electric Corp., P. O. Box 868, Pittsburgh 30, Pa. J-21753



Here is a closing arrangement with fewer moving parts. The entire contact assembly pivots on a knife-edge of hardened steel. There are no sliding surfaces to bind or wear... no misalignment troubles. Jamming and sticking are eliminated. Nothing need be lubricated.



Westinghouse Pre-lubricated Bearings have the proper lubricant sealed in at the factory. Greasing schedules can be forgotten. Special seals guard against the entrance of harmful dust and dirt which ordinarily spell wear and possible bearing burnout.



YOU CAN BE SURE...IF IT'S  
**Westinghouse**





**15A-50S QUICK-CHANGE HOLDER**

**15-XDM-4 DRILL SLEEVE FOR #4 MORSE TAPER DRILL**

**15-XI-14 END MILL ADAPTOR FOR 3/8" END MILL**

**53-10 INSERTED SOLID CARBIDE BLADE SHELL END MILL**

**15XH-1 1/2 - 10 1/2 - 30 BORING BAR**

**15-XCS-24 ADAPTOR, LOCK SCREW & WRENCH**

**Beaver QUICK-CHANGE VERSATILITY CUTS OPERATIONAL COSTS**

No matter what your tool requirements may be — no matter how often tools must be changed—Beaver Quick-Change Tool Holders and Adaptors will save you money.

Beaver's versatile Quick-Change Tooling permits the use of shell mills, face mills, end mills, drills, reamers, boring bars and other desired tools on any Beaver equipped machine without loss of accuracy.

Less than ten seconds per tool change gives you maximum production from each machine. Down-time reduced to an unbelievable minimum.

Beaver Quick-Change Tooling can be installed on most standard machines. Let us show you how it will benefit YOUR machine operations.

Write for our complete catalog #52.

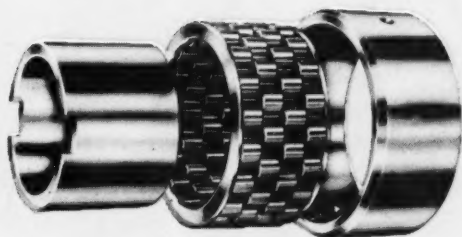
**Beaver TOOL AND ENGINEERING CORPORATION**

2850 ROCHESTER ROAD • BOX 429, ROYAL OAK, MICH. Teletype - Big Beaver 648

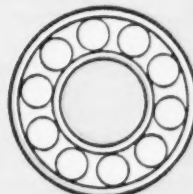


# More Load Capacity!

— because more rollers support the load



In Orange "Staggered" Roller Bearings the load is distributed over many short rollers, instead of a few full length rollers.



End views of a Staggered bearing and conventional bearing show how the staggered rollers provide a multiplicity of contact points within the loaded zone.

## Outstanding for Heavy-Duty Service

Wherever radial loads are extremely heavy—operating conditions are unusually severe—and even, precision running is absolutely essential . . . install Orange "Staggered" Roller Bearings.

The use of many short rollers in staggered arrangement, instead of fewer long rollers, provides the following advantages:

- Extra load capacity that does the work of larger conventional bearings.
- Smooth, precision running due to uniform distribution of load.
- Elimination of skewing tendencies of long rollers.
- Longer bearing life and extra margin of safety for your installations.

# ORANGE

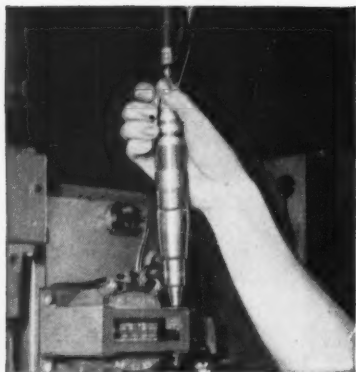
## "STAGGERED"

### ROLLER BEARINGS

Orange "Staggered" Roller Bearings are available in a full range of standard sizes, fully interchangeable with other bearings in the 200 and 300 series. Engineering service and stocks in all industrial centers. Write for Engineering Data Book.



**ORANGE ROLLER BEARING CO., INC., 552 Main Street, Orange, N. J.**



# NOW!

## a REALLY QUIET air screwdriver

— the new CP air-powered  
screwdriver with super-sonic exhaust

Super-sonic exhaust holds the key to CP's quiet operation. Exhaust sound waves are changed to a frequency which approaches the limit of human hearing — resulting in an air-powered screwdriver that's *really quiet*.

And more! A side outlet exhaust deflector can be rotated and locked in any position for directional exhaust. Smooth-acting, adjustable clutch can be adjusted and locked without any tools. Built-in speed control assures precision speed increases or decreases. Available with a full line of accessories, the all-steel CP-3008 weighs only 1 lb., 14 oz. — has a rated range of #4, #6 and #8 screws but under most conditions can be used on #2's and #10's. Write for Bulletin SP-3096. *Chicago Pneumatic Tool Company, 8 East 44th St., New York 17, N. Y.*

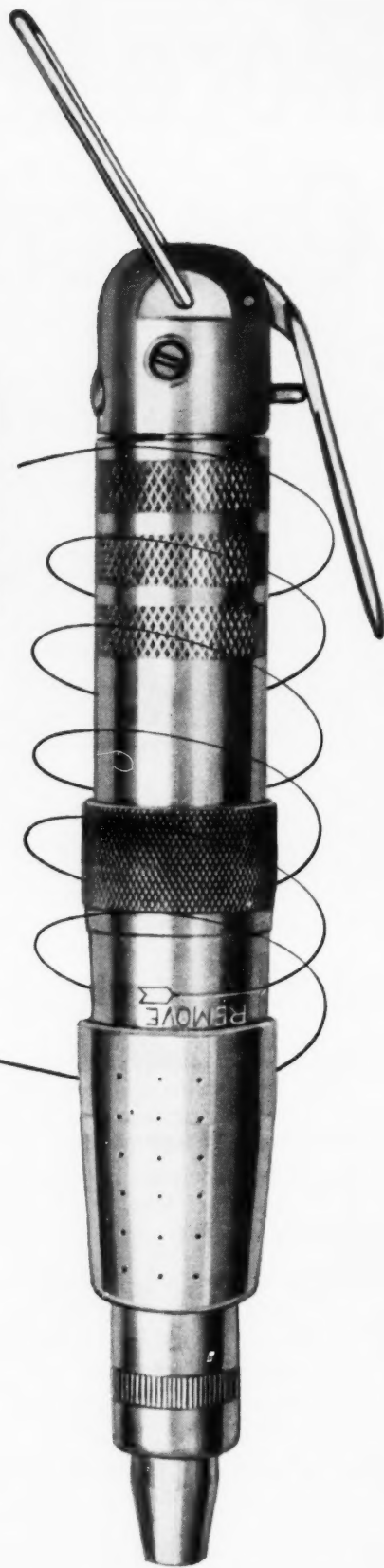


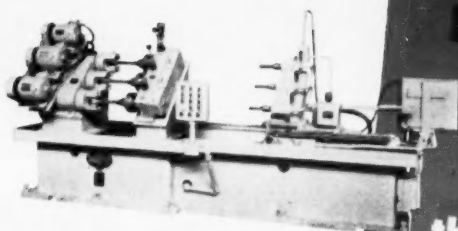
## Chicago Pneumatic

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES • ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES

308—MACHINERY, September, 1953

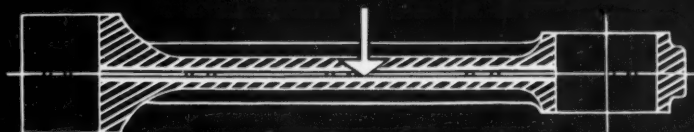
For more information on products advertised, use Inquiry Card, page 239





# NATCO Deep Hole Driller DRILLING 5/16" HOLES UP TO 14½" DEEP through 3 connecting rods at one time!

5/16" oil holes drilled through connecting rods from 12¼" to 14½" deep.



## THIS NATCO FEATURES—

**FLEXIBILITY**—Performs operations on 3 of any one of seven different sizes of diesel engine connecting rods.

**TYPE OF TOOL**—Oil tube type gun drill held stationary.

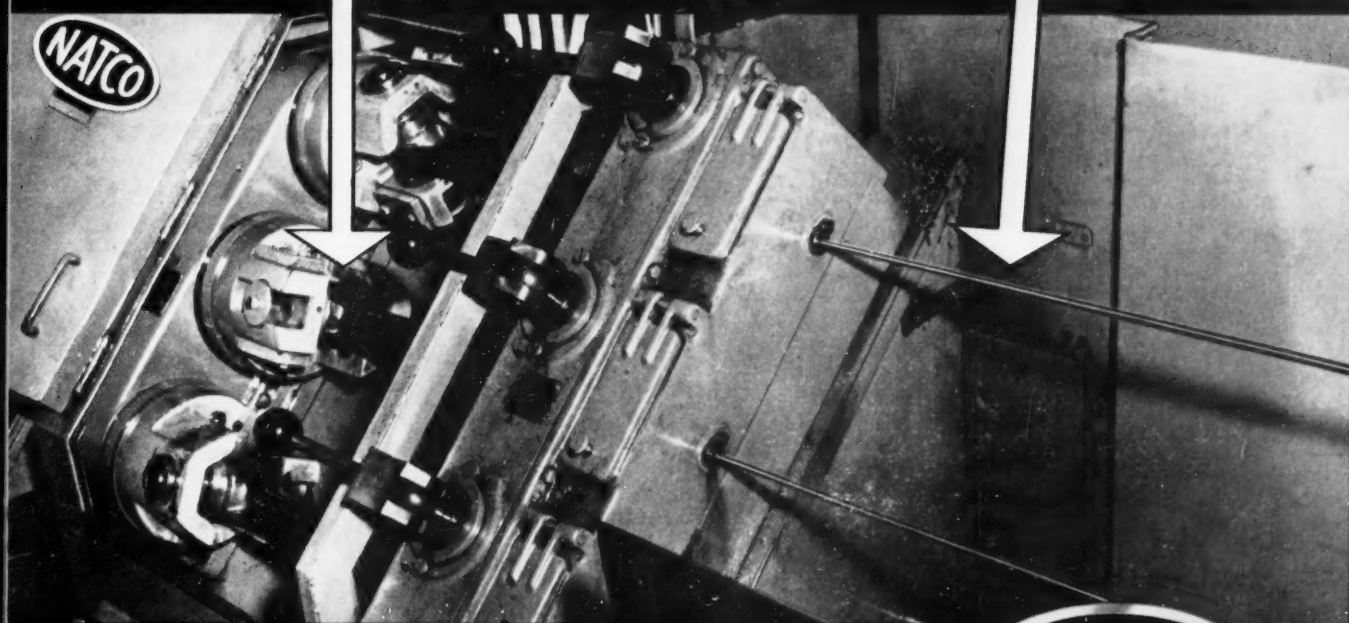
**FIXTURE**—Three rotating type holding units.

**DEPTH OF HOLES**—Holes vary from 12¼" to 14½" depth.

**COOLANT**—High pressure coolant through drills to remove chips.

**SAFETY**—Torque overload is provided for tool protection.

**PRODUCTION**—Approximately 8 parts per hour.



*Call a Natco Field Engineer*  
to help you solve your problems in  
Drilling, Boring, Facing and Tapping.



**NATIONAL AUTOMATIC TOOL COMPANY, INC., Richmond, Indiana**

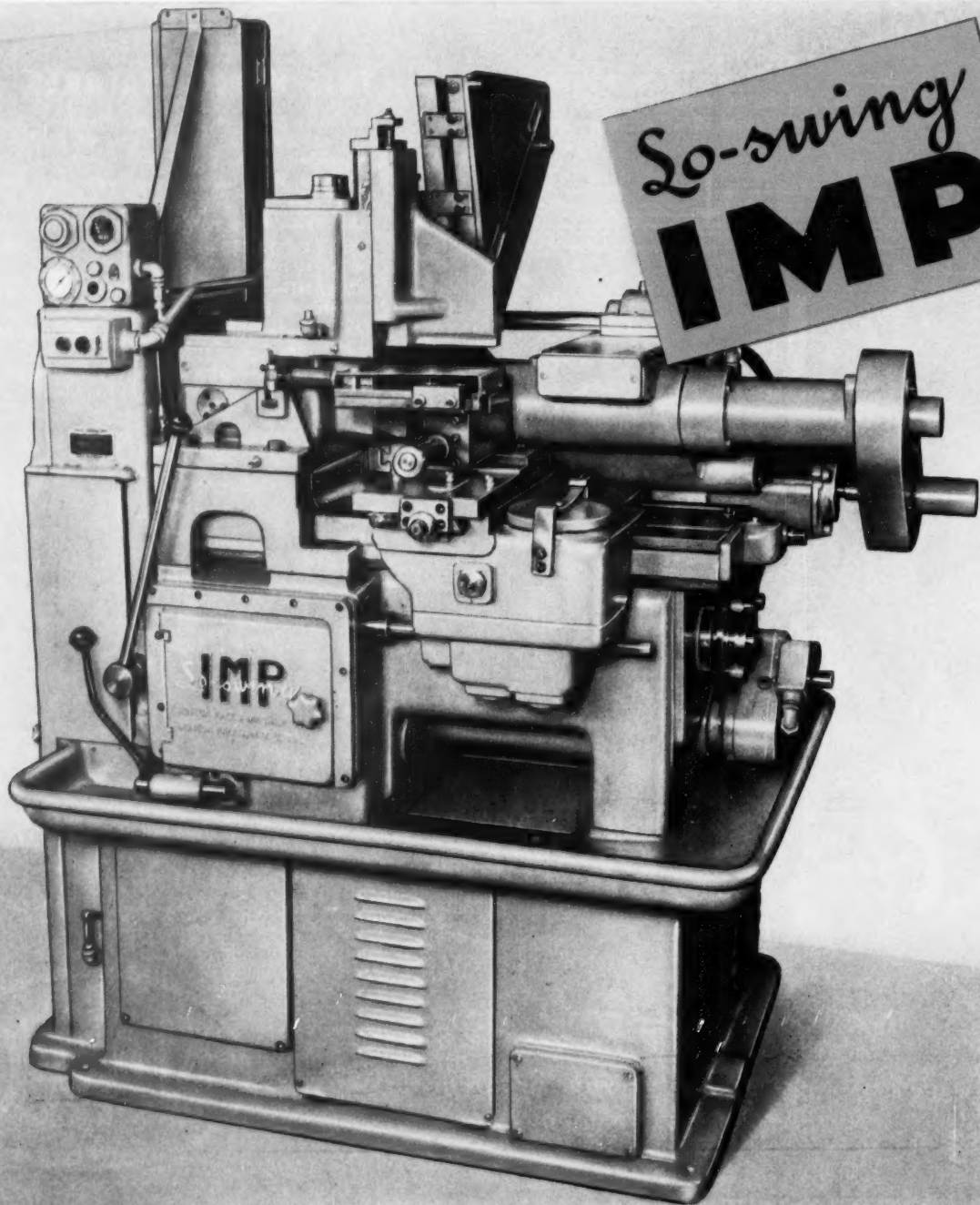
*Branch Offices*

CHICAGO, 2009 Engineering Bldg. • DETROIT, 409 New Center Bldg.  
BUFFALO, 1807 Elmwood Ave. • NEW YORK, 35 Beechwood Ave., Mount Vernon



# MACHINE OF

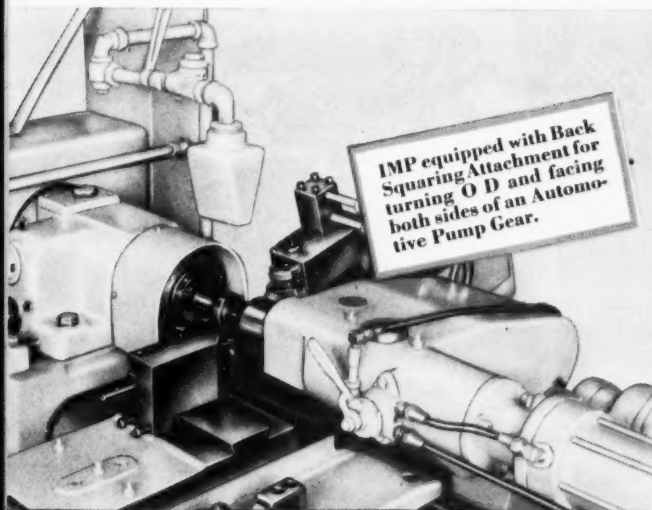
**A VERSATILE AUTOMATIC LATHE FOR SMALL WORK  
DEMANDING HIGH SPEEDS & EXTREME ACCURACY**



**PRODUCTION COSTS**

# THE MONTH

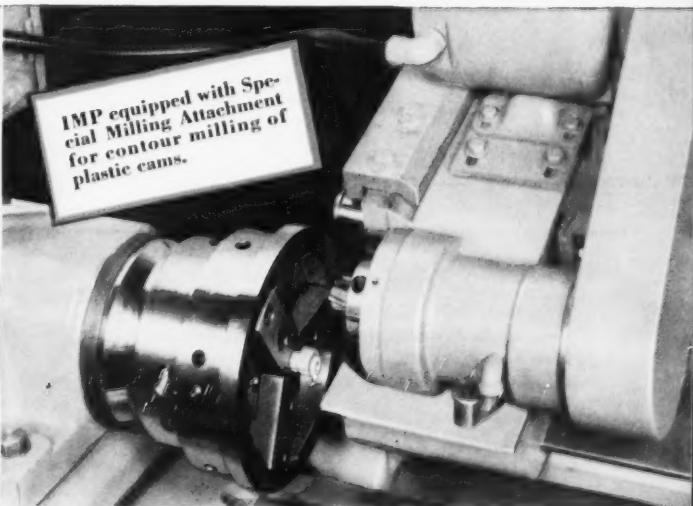
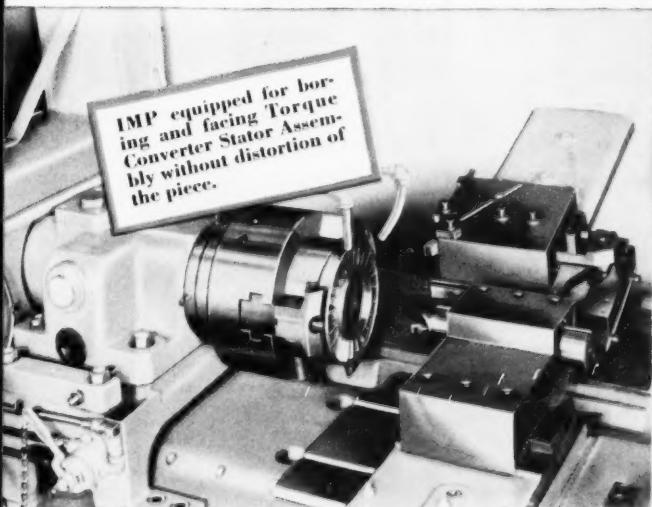
PREPARED BY THE SENECA FALLS MACHINE CO. "THE Lo-swingy PEOPLE" SENECA FALLS, NEW YORK



The Lo-swing IMP Automatic Lathe lends itself to practically unlimited tooling possibilities. Illustration on opposite page shows an IMP equipped with Third Slide and Rotary Type Automatic Loader for turning automobile valve guides. The close-up views above and below show typical applications of standard and special attachments

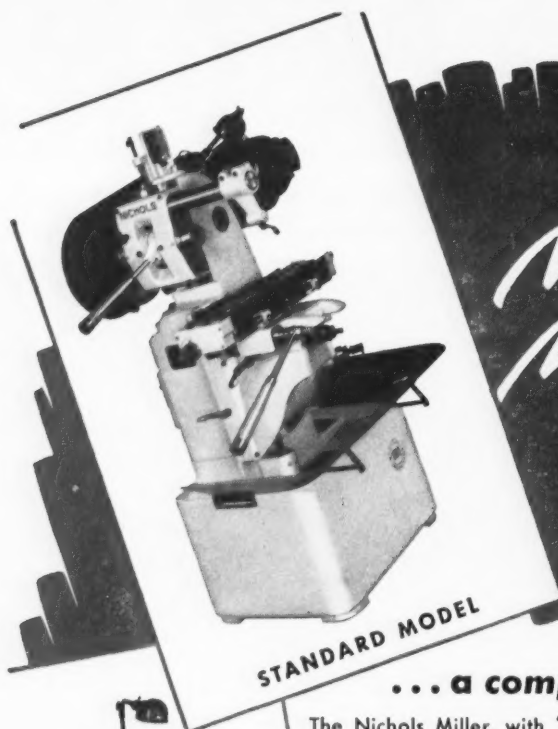
to the base machine which have resulted in increased production and lower costs.

If you have a production turning job requiring high speeds, fine finishes and extreme accuracy, write for IMP Bulletin No. N-50. Seneca Falls engineers will be glad to assist you with any of your turning problems.



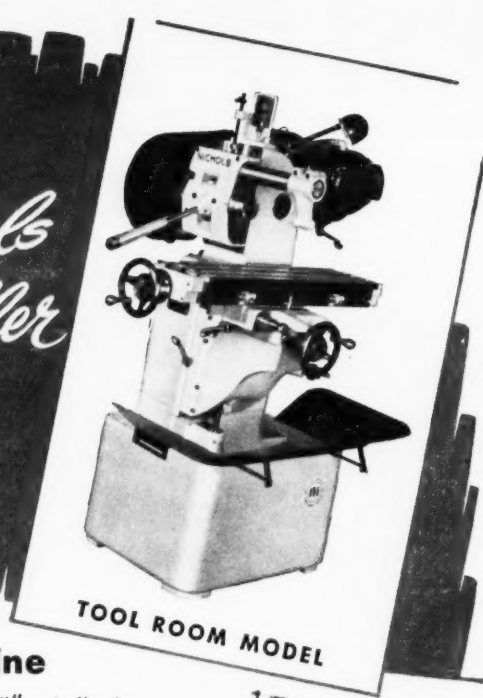
SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

## ARE LOWER WITH Lo-swingy



STANDARD MODEL

*Nichols  
Miller*



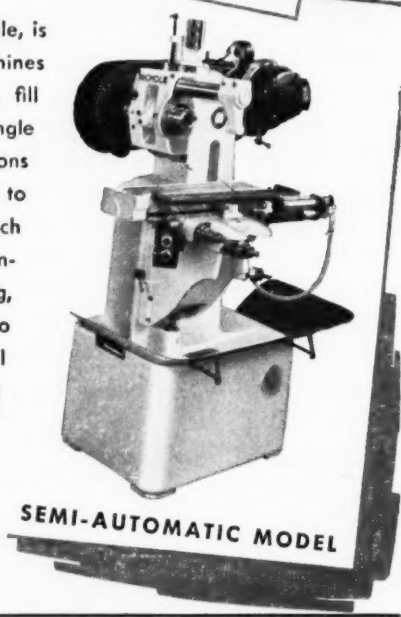
TOOL ROOM MODEL

... a complete line

The Nichols Miller, with "rise-and-fall" spindle, is one of the most precise, universal machines available today. The four models shown, fill most basic requirements—whether for single parts with simple set-up, or multiple operations on mass production jobs with tolerances to "tenths". Their versatility makes possible such operations as facing, boring, recessing, turning, slotting, key seating and contour milling, as well as regular milling. According to requirements, screw or lever longitudinal and transverse table feeds are available optionally. "The miller that uses its head" is your best choice—and one of industry's greatest values. If you want production to "tenths", investigate the Nichols Miller.



PRODUCTION MODEL

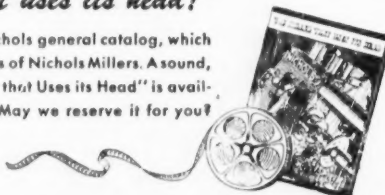


SEMI-AUTOMATIC MODEL



*"the miller that uses its head!"*

Write today for the Nichols general catalog, which describes the six models of Nichols Millers. A sound, color movie "the Miller that Uses its Head" is available for free showing. May we reserve it for you?



CONDENSED SPECIFICATIONS

|  |                     |
|--|---------------------|
| Table Working Surface                    | 6 3/4" x 21" or 30" |
| Longitudinal Travel (screw or lever)     | 10" or 19"          |
| Transverse Travel (screw or lever)       | 7"                  |
| Vertical Travel — Knee                   | 13 1/2"             |
| Rise and Fall of Spindle                 | 4 1/2"              |
| Selective Speed Ranges up to 5000 R.P.M. |                     |
| Weight                                   | 1250 lbs.           |

MANUFACTURED BY W. H. NICHOLS COMPANY WALTHAM, MASSACHUSETTS

NATIONAL DISTRIBUTORS

**NICHOLS-MORRIS CORPORATION**

76-E MAMARONECK AVE.  
WHITE PLAINS, N. Y.



# DEPENDABILITY... that builds dividends **Delco Motors**

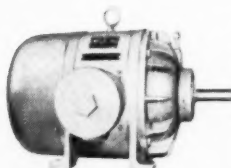
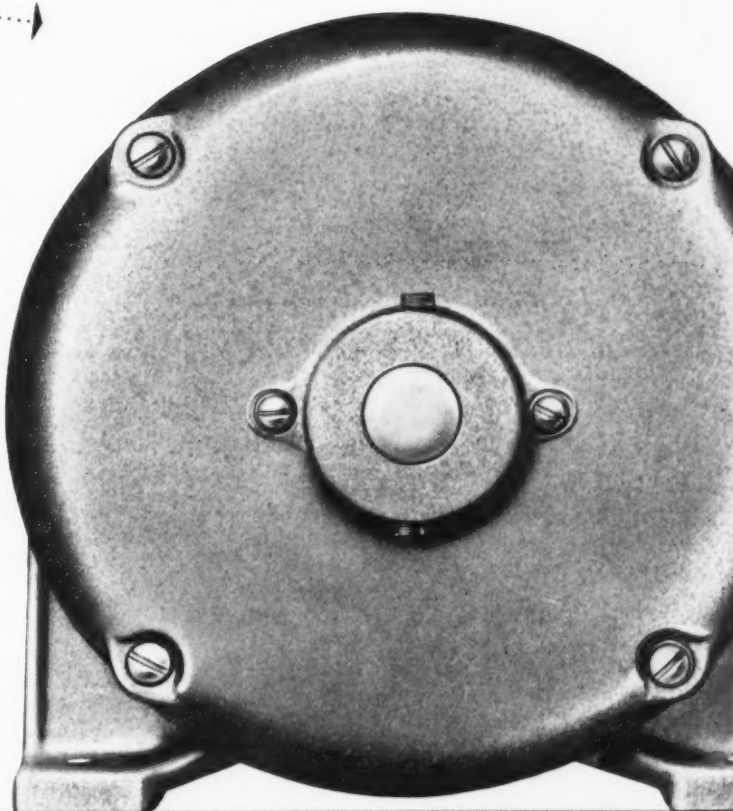
Delco integral motors are one item of manufacturing cost that does not come under the head of "variable." They are so consistently dependable in operation that they have a stabilizing effect on production costs—and on dividends.

There are Delco motors for most applications—motors that will fit into **your** needs. A sales engineer from any one of the offices listed below will respond to your inquiry.

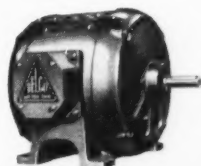


**DELCO  
PRODUCTS**

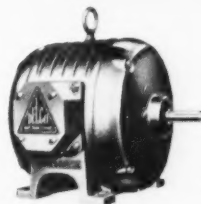
Division of General Motors Corporation  
Dayton, Ohio



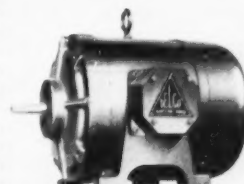
Explosion-Proof Motor



Open Ball-Bearing Motor



Totally Enclosed Motor



Totally Enclosed Fan-Cooled Motor

**SALES OFFICES:** Atlanta • Chicago • Cincinnati • Cleveland • Dallas • Detroit • Hartford • Philadelphia • St. Louis • San Francisco

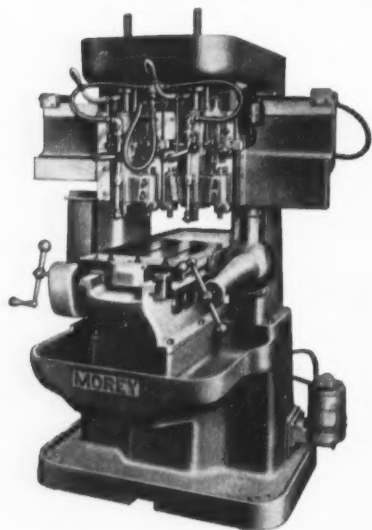
For more information on products advertised, use Inquiry Card, page 239

MACHINERY, September, 1953—313



*Progressive Design  
for Greater Production...*

## **MOREY MACHINE TOOLS**



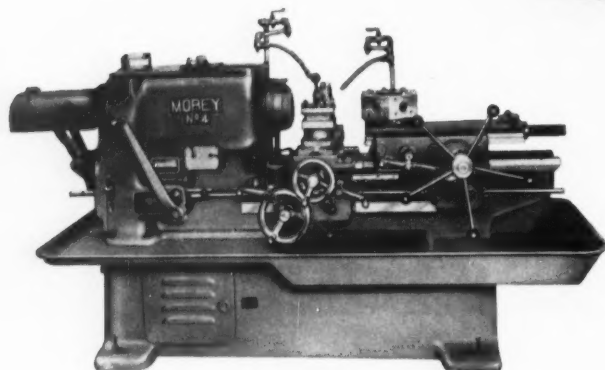
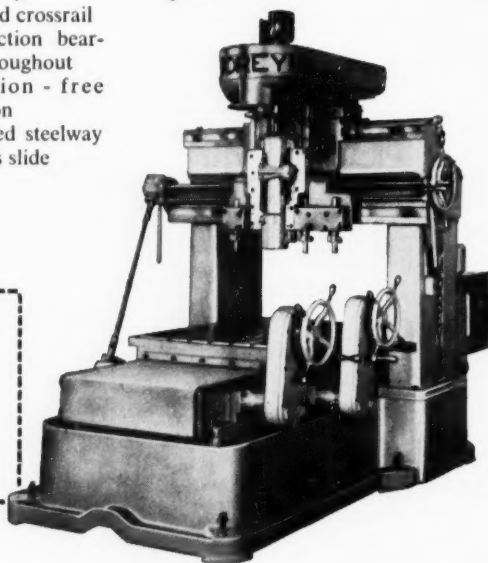
### **MOREY NO. 12-M VERTICAL PROFILER and MILLER**

Designed for the economical duplication of parts requiring accurate interchangeability.

- Balanced crossrail
- Anti-friction bearings throughout
- Vibration - free operation
- Hardened steelway on cross slide

### **MOREY NO. 40-M "AEROFRAME" PROFILER and MILLER**

Ideal for milling and profiling irregular and complicated precision machine parts.



### **MOREY TURRET LATHES**

Ruggedly built to attain the maximum speeds and feeds the work and tool will permit.

- No. 2 1" x 6"
- No. 3 1½" x 10"
- No. 4 2" x 12" (Illustrated)
- No. 5 2½" x 14"

**PROMPT DELIVERY**

For complete information and specifications on any of these machine tools write, wire or phone today . . . Or visit our demonstration hall and see them in operation!



**MOREY MACHINERY CO., INC.**  
Manufacturers • Merchants • Distributors

410 BROOME STREET • NEW YORK 13, N. Y.  
CANAL 6-7400 • CABLE ADDRESS: WOODWORK, N. Y.

# ANACONDA METALS AT WORK



## Meet the educated screw

This is a whole family of screws, known as Screwsticks, and joined head-to-toe. Insert a Screwstick in the driver, aim it at the hole—and from there on the Screwstick tightens itself to the predetermined torque, shears itself and gets its head burnished by the following screw which automatically advances itself. It's so fast that American Screw Co. of Willimantic, Conn., which uses ANACONDA Hexagon Brass Rod, refers to it as "jet propulsion".



## Don't lose your grip

Once a novelty trick developed by the Chinese, the manufacture of these grips is now an industry. Made in a wide variety of styles and sizes by Economy Cable Grip Co. of Norwalk, Conn., they are used to anchor suspended electric power cables and to seize the end for pulling through ducts. The harder you pull, the tighter they grip. Needless to say, the ANACONDA Bronze Cable, Everdur® Rod and Copper Tube used in their manufacture never weaken from rust.



## A fast delivery...with mustard



When baseball fans want their hot dogs, they want them fast—so Stainless Alloy Fabricators of Detroit built this "Double-Header" baseball park hot dog server. Its big capacity for hot dogs—and fast service—is its double bun warmer, one at each end, heated by copper water boilers. If the water runs dry, it's no strike-out. Boilers are made of phosphorized copper sheet with joints formed by fusing the edges with a Heliarc torch. No solder used, no seams to burn open.



## How to treat a fracture

A fracture often means long uselessness—but that needn't be true of machinery. Usually braze welding can make it good as new and at a fraction of the time and cost of replacing it. This fractured cast iron conveyor drive sprocket, for example, would have taken two months to replace. The Universal Welding Co., Rochester, N. Y., repaired it in only 7 hours by braze-welding with ANACONDA-997 (Low Fuming) Bronze Welding Rod. Moral: don't count the patient out before consulting your welder.

## There's more to this than meets the eye

In our Technical Department you will find a range of experience that covers the entire field of copper and copper-alloy applications in the metalworking industries. If you have a problem of metal selection, we are at your service. *The American Brass Company, Waterbury 20, Connecticut. In Canada: Anaconda American Brass Ltd., New Toronto, Ont.*

\*Reg. U. S. Pat. Off.

5301

**ANACONDA** the name to remember in **COPPER-BRASS-BRONZE**

For more information on products advertised, use Inquiry Card, page 239

MACHINERY, September, 1953—315

# DESIGNING

for the

**DENTAL EQUIPMENT FIELD**

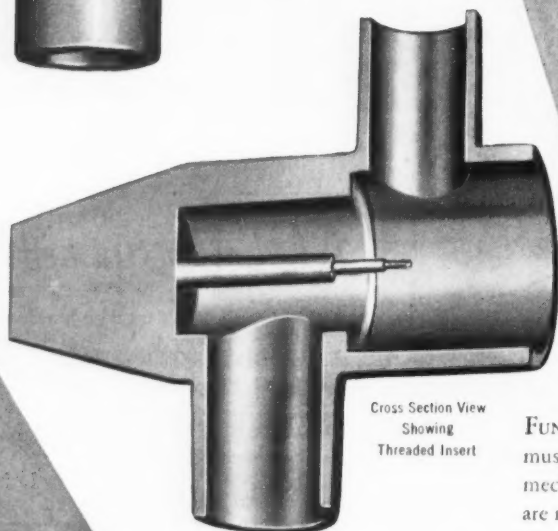
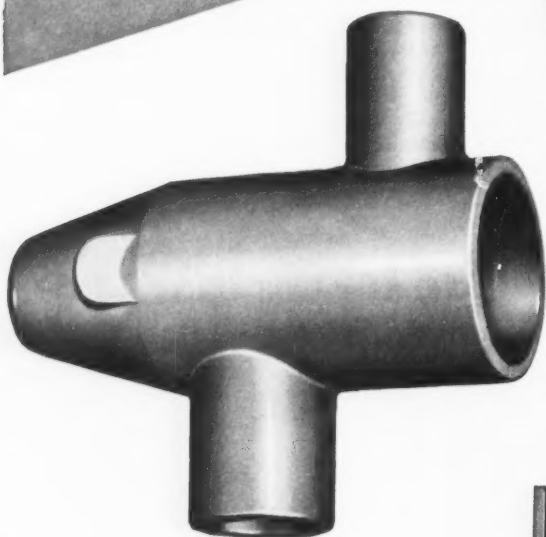
with

**MADISON-KIPP**

**ZINC and**

**ALUMINUM**

**DIE CASTINGS**



Cross Section View  
Showing  
Threaded Insert

Madison-Kipp aluminum die castings made for the Ohio Chemical & Surgical Equipment Co., a Division of Air Reduction Company, Incorporated, for their New Ohio Dental Analgesia Unit for administering TRIMAR.

FUNCTIONAL COMPONENTS of dental equipment must be made with the greatest care known to the mechanical industries. Highest quality die castings are required and that is why Madison-Kipp products are often specified as in the case of the Non-rebreathing Valve and Vaporizer support here illustrated. Madison-Kipp is skilled and seasoned in die casting mechanics and invites your inquiries for co-operative effort.

**MADISON-KIPP CORPORATION**  
203 WAUBESA STREET, MADISON 10, WISCONSIN



# kipp

• Skilled in Die Casting Mechanics • Experienced in Lubrication Engineering • Originators of Really High Speed Air Tools

WITH A BLANK OF STAINLESS STEEL...

GET THESE RESULTS BY

# Hydroforming

DEEP DRAW IN 1 OPERATION



5 1/2" High—4 1/4" Dia.

COVER OF .035"  
TYPE 305 STAINLESS

Drawn to depth indicated with recessed top in 1 operation.

PRESERVE SURFACE FINISH



4" Sides

CORNER BALL OF 20 GA.  
TYPE 302 STAINLESS

Pre-polished blanks coated with protective plastic were drawn to shape with plastic coating completely intact.

HOLD CLOSE TOLERANCES



1 1/4" Dia.

DIAPHRAGM OF .010"  
TYPE 304 STAINLESS

Two parts mate with an air-tight fit.

FORM INTRICATE SHAPES



6" Long—3" Tee section

MANIFOLD OF .040"  
TYPE 347 STAINLESS

Short-run aircraft part formed using Kirksite punch in 1 operation.



3" Long—1 1/2" Wide

CROSS-OVER DUCT OF .035"  
TYPE 321 STAINLESS

Drawn with contoured flange in 1 operation.



3" High—8" Long

JET-ENGINE DUCT OF .032"  
TYPE 321 STAINLESS

Shape with open ends, having intricate surface detail, formed in 1 operation with minimum springback.

With the tremendous power available, the cold drawing and forming of stainless steels present no problem to the Hydroform. With its unique drawing action and continuously controlled forming pressure, most parts are drawn in a single operation.

Tool costs are reduced 70% or more, as a male punch and a simple draw ring are the only tools required. Expensive die sets, with their attendant

high maintenance costs, are eliminated. The cushioned action of the flexible die member forming the material to the punch reduces punch wear and minimizes the possibility of galling.

Contact your nearest Cincinnati Milling field engineer for complete details on Hydroforming. For a description of the five sizes of Hydroform machines, write for Bulletin M-1759-2.



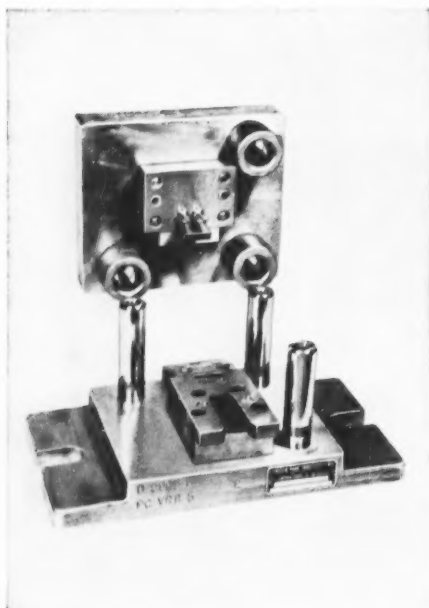
**Hydroform**

THE CINCINNATI MILLING MACHINE CO.  
CINCINNATI 9, OHIO, U.S.A.



# Whether your dies are simple...

you can speed production, save time and money,



**1** Simple pierce and cutoff die, designed for Electric Auto-Lite Co., Toledo, operates at speeds faster than 400 strokes per minute. Die has produced over 2,000,000 strokes . . . and still does not require resharpener.

## Actual performance records prove carbide dies effective over wide range of uses

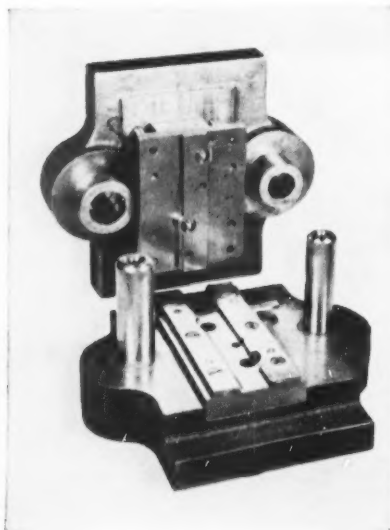
**A**CTUAL plant performance has proved how easy and profitable it is to use Carboloy cemented carbide over a wide range of applications. For blanking, forming, drawing and piercing . . . for large or small, simple or complex dies . . . only carbides will give you benefits like these:

- Production runs 35 times greater than steel (see picture No. 7)
- Over two million high-speed strokes . . . without needing resharpener (see picture No. 1)
- Accurate tolerances held for months . . . compared to days with steel (see picture No. 6)

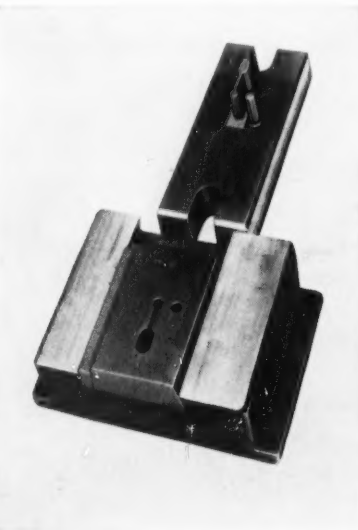
Read the case histories on these pages. They are but a few from the wide range of carbide press-die applications. Then explore the possibilities of carbide in your press dies. Carboloy personnel and services will give you or your die maker every possible assistance.

If you wish, a Carboloy Sales Engineer will call at your plant, without obligation. He'll show you how simple it is to apply and maintain carbide dies; how to get increased production with fewer rejects. Or, you can send your key personnel to the Carboloy Training School in Detroit.

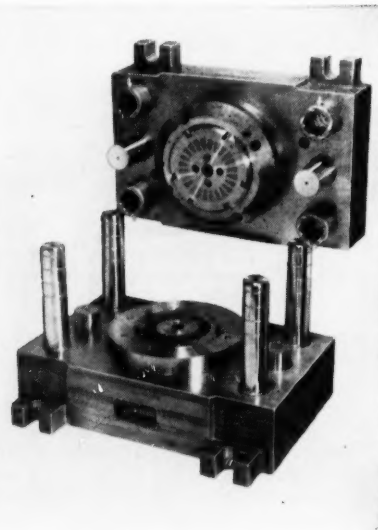
Also, you can get free Carboloy Die Engineering Manual D-124. It shows you how easy it is to design, apply and maintain carbide dies. Get all these free, profit-building Carboloy services by mailing the coupon at right.



**2** Simple progressive washer die, used at Precision Spring Company, Detroit, Michigan, pierces and blanks spring-tempered steel washers. This die delivers several million hits per sharpening.



**3** Notching die, wearproofed with Carboloy cemented carbide, stands up under severe day-after-day pounding. Because carbide wears 10 to 50 times longer than steel, maintenance costs are lower.



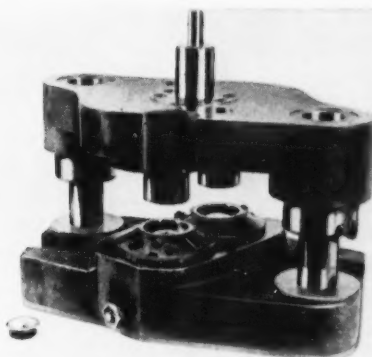
**4** Piercing die, made for E.M.F. Dordt, Holland, was designed to pierce a small stator in 24 places. When dies have been wearproofed with cemented carbide, production increases, downtime decreases.

# or whether they are complex

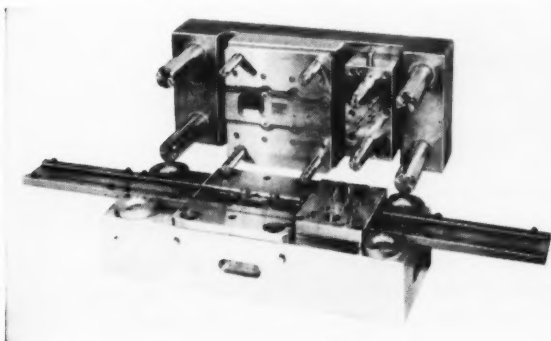
by equipping them with **CARBOLOY**  
CEMENTED CARBIDE



**5** Single notching dies, also made for E.M.F. Dordt, Holland. Special design permits details to be interchanged on the same shoes to take full advantage of the carbide in short-run production.



**6** Blanking and drawing of screw bottle caps is done by this die for Armstrong Cork Company, Lancaster, Pa. Die operated accurately on material .006" thick for months. Steel die had to be changed each week.



**7** Lamination die made for Schick, Inc., produces rotor and stator laminations of motor-grade silicon steel. Customer reports carbide die produces average runs 35 times as long as steel dies.



**8** Lamination die punches two, high-silicon "L" laminations per stroke. Dies of this type are in use throughout the metal-working industry, outwearing and outproducing steel dies time and again.

## CARBOLOY

DEPARTMENT OF GENERAL ELECTRIC COMPANY

"Carboly" is the trademark for the products of the Carboly Department of General Electric Company

**FILL OUT THE COUPON . . . MAIL IT TODAY!**



CARBOLOY Department of General Electric Company  
11147 E. 8 Mile Blvd., Detroit 32, Michigan

- ☐ Rush me free Carboly Die Engineering Manual D-124
- ☐ Send complete details on free Carboly Training School
- ☐ Have a Carboly Field Engineer call at my plant

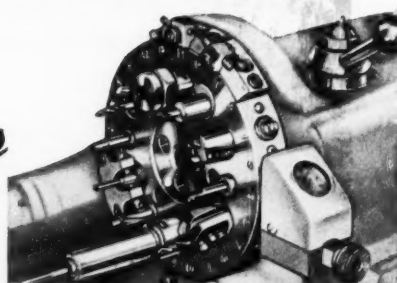
Name \_\_\_\_\_ Position \_\_\_\_\_  
Company \_\_\_\_\_  
Address \_\_\_\_\_  
City \_\_\_\_\_ Zone \_\_\_\_\_ State \_\_\_\_\_

For more information on products advertised, use Inquiry Card, page 239

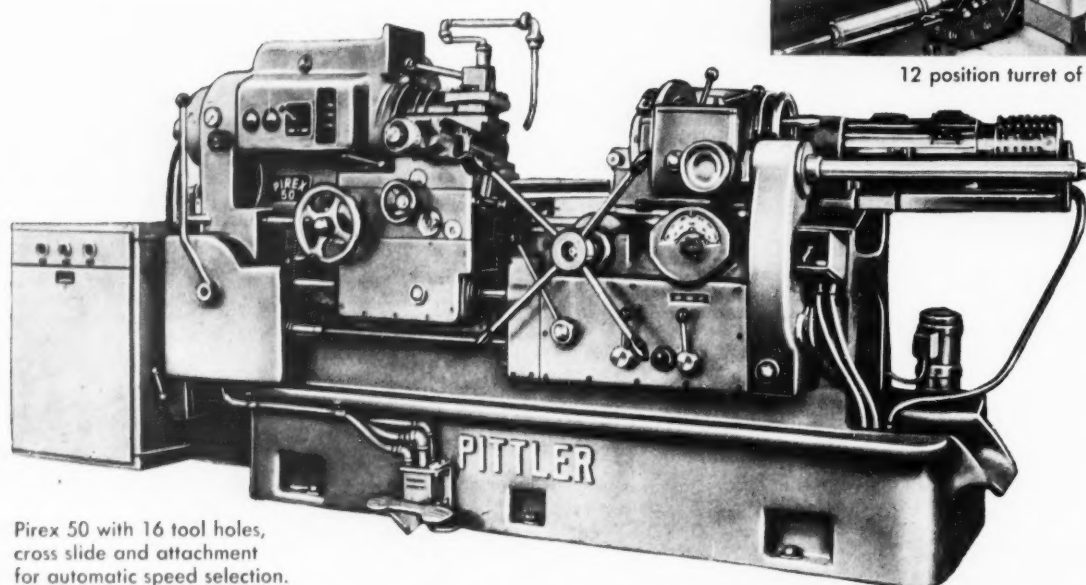
MACHINERY, September, 1953—319

# PIREX TURRET LATHES

*with  
12 or 16 Turret Tool Holes*



12 position turret of Pirex 32



Pirex 50 with 16 tool holes, cross slide and attachment for automatic speed selection.

Meet your increased turning demands with PIREX Turret Lathes. Built by Pittler, manufacturers of turret lathes for over 60 years, PIREX Lathes have all the latest engineering features for maximum output . . . 12 or 16 tool holes to reduce set-up time . . . Powered with motors up to 12 hp for high speed cutting with carbide or high speed tools.

Rigid construction for high surface finishes . . . Ample speeds and feeds . . . Patented speed selector for instantaneous selection of spindle speeds . . . Gears are changed automatically by magnetic clutches . . . Coarse, medium or fine feeds have stepless, variable adjustments within each range.

## *Principal Specifications*

|                                 | PIREX 32    | PIREX 50    |
|---------------------------------|-------------|-------------|
| Bar capacity . . . . .          | 1.25"       | 2"          |
| Swing over bed . . . . .        | 14"         | 15.7"       |
| No. of Tool Holes . . . . .     | 12          | 16          |
| No. of Spindle Speeds . . . . . | 16          | 11          |
| Spindle speed R.P.M. . . . .    | 71-1800     |             |
| Feeds . . . . .                 | 90-2250     | 18-1800     |
| Longitudinal and transverse     |             |             |
| Fine . . . . . i pr             | .001"-.009" | .001"-.009" |
| Medium . . . . . i pr           | .002"-.020" | .002"-.020" |
| Coarse . . . . . i pr           | .004"-.040" | .004"-.040" |

SEND FOR CATALOG DESCRIBING PIREX TURRET LATHES

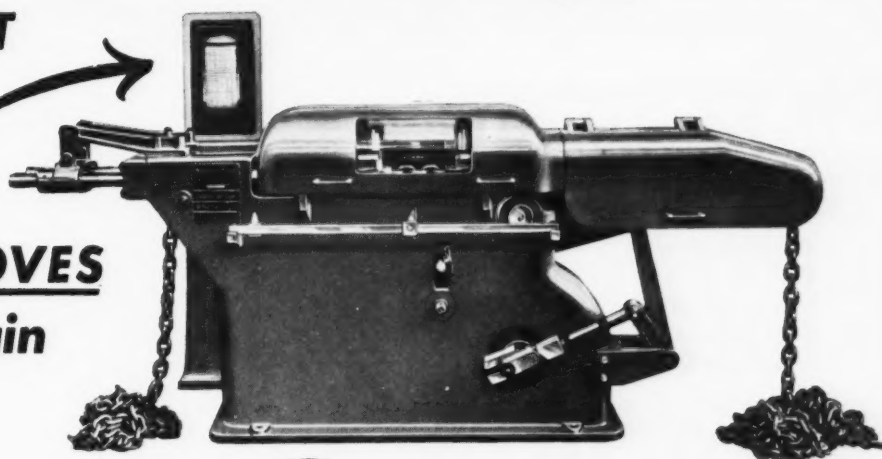
**COSA CORPORATION**  
405 Lexington Ave., New York 17

**Your source for all Precision Machine Tools—  
from Small Bench Lathes to Large Boring Mills**

IN DETROIT AREA contact DETROIT-COSA CORPORATION, 16923 James Couzens Highway, Detroit 35, Mich.

**WHOEVER BUYS THIS CHAIN** 

**CAN GET**  
*this*  
**CHART**  
**which PROVES**  
**the chain**  
**is good**



**it was tested on a  automatic tester**

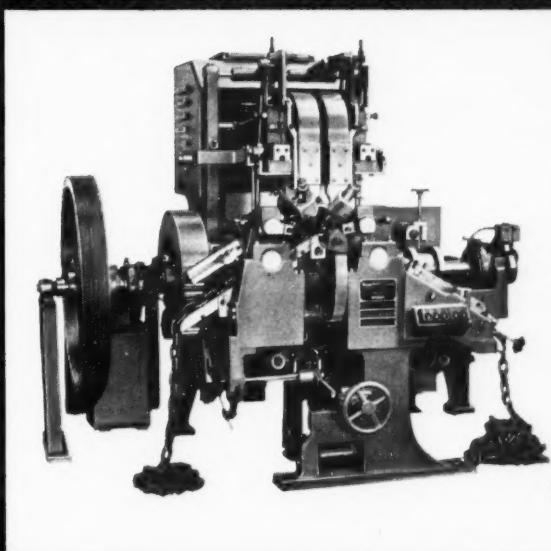
Meyer, Roth & Pastor chain testers do a more complete and accurate job than ever before. Depending on pitch and wire diameter, lengths of chain from 3 to 13 links can be tested at a time, and up to 45 lengths can be tested in one minute, automatically. Furthermore, for each length which meets tolerances, a continuous-line chart is produced which you can deliver with the chain as proof of thorough testing.

Here's how it works: each section of chain is stretched to a pre-determined length. The chart shows the tensile strain used to stretch each section. Those which stretch to the limit before minimum strain is

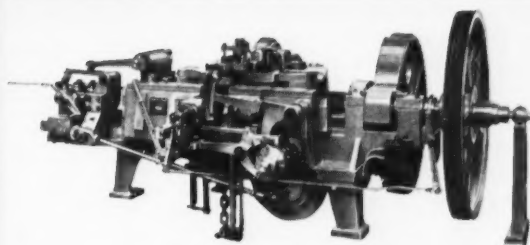
applied are too weak—those which require strain over maximum have short links which weaken during testing. Both types, including those which break during tests, are rejected, and the machine stops automatically. However, sections which reach full length between mini and maxi strains are passed, and each one has the chart to prove it.

In addition to testing chain and recording results, this machine performs one other important operation: from each test-proved length of chain, one link is automatically stamped, either with your trademark or some other product identification.

**AUTOMATIC CHAIN WELDING MACHINES**



**AUTOMATIC CHAIN BENDING MACHINES**



↑ Excellent for short or long links. Two-position bending (for wire diameters of  $\frac{3}{8}$ " or more) prolongs tool life and reduces bending marks on links. 7 sturdy models. Capacities: wire stocks up to 1" dia. Speeds: up to 130 links/min.

← Automatic, mechanical control during welding provides excellent welds, even on alloy steel. Attachment shaves off burrs around complete diameter of each weld smoothly, automatically. 9 sturdy models. Capacities: wire stock up to 1  $\frac{1}{32}$ " dia. Speeds: up to 85 links/min.

**WE'LL SEND CATALOGS ON ANY OR ALL OF THESE MACHINES, IF YOU WANT THEM**

**COSA CORPORATION**  
405 Lexington Ave., New York 17

IN DETROIT AREA contact DETROIT-COSA CORPORATION, 16923 James Couzens Highway, Detroit 35, Mich.

**Your source for all Precision Machine Tools—  
from Small Bench Lathes to Large Boring Mills**

For more information on products advertised, use Inquiry Card, page 239

MACHINERY, September, 1953—321



MULTIPRESS . . . smooth oil-hydraulic power, designed for cost-cutting production

# MULTIPRESS®

Improves

## DEEP DRAWING

Production for Radiad\*

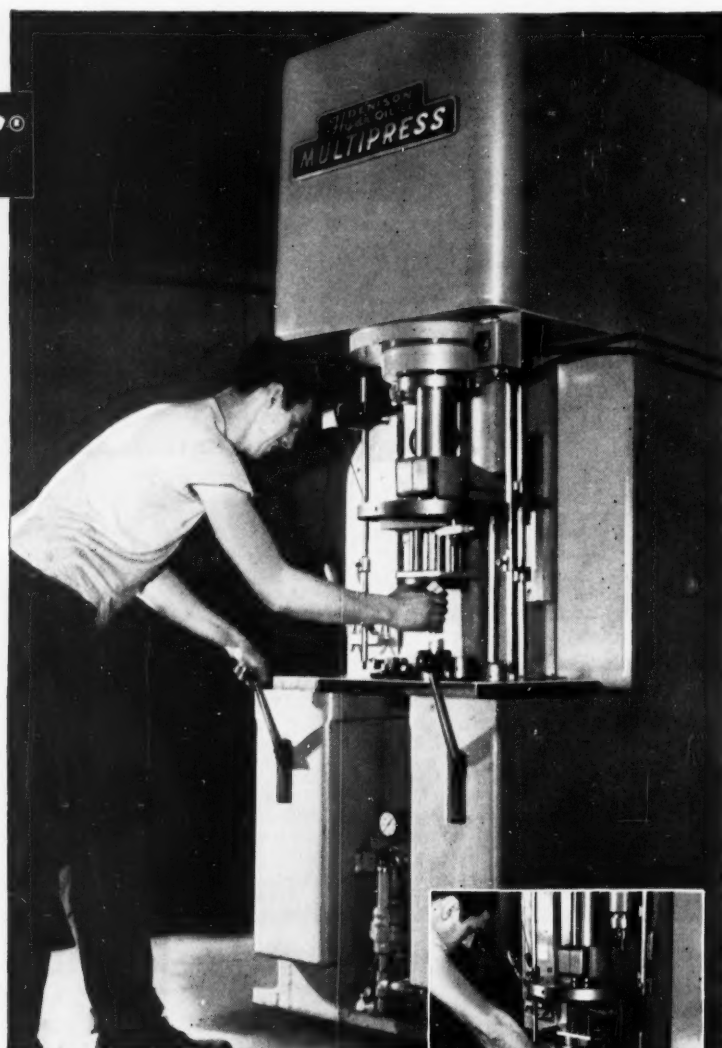
"We find that the smooth, evenly controlled speed of the Multipress ram does a better job on a wide range of deep drawing operations," says Mr. Ed Foertsch, President of \*Radiad Service, Inc., Chicago.

For most deep drawing operations, Radiad, a widely experienced contract manufacturer uses the 50-ton Denison Multipress. A second hydraulic ram mounted in the U-slot base of the press permits up to 8 tons of upward pressure . . . for added cushioning effect on some operations.

"We also gain by pinch-trimming many flared-lip shapes as part of the final draw," Mr. Foertsch added.

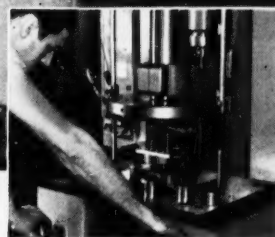
Like many other users, Radiad has proved to themselves that Multipress, with its versatility and speed, is the low-cost answer to drawing needs.

There's no hammer-blow impact as Multipress tooling contacts the work. A steady, positive stream of power draws the metal SMOOTHLY into shape. Stroke length, ram speed, and pressure limits are easily pre-



set to suit each job, or to the flow characteristics of any metal. And the Multipress ram can be set to reverse the instant a pre-set pressure is attained.

As a result, deeper draws can be made. Multiple-stage jobs can often be handled in half the draws required by other equipment. There's less wear and tear on tooling. Costly dies last longer, are less subject to damage. And the need for pre-draw annealing is often eliminated.



Dual Multipress controls increase safety on drawing jobs at Radiad.



INDUSTRY'S  RIGHT HAND

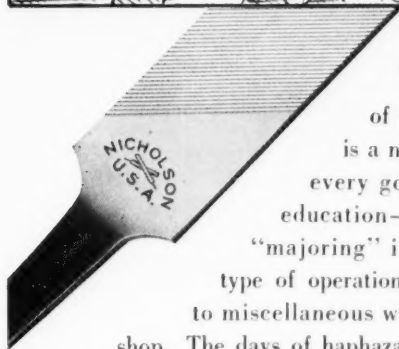
**DENISON**  
*HydrOILics*

Many additional features make Multipress a profitable investment; not only for drawing, but for broaching, bending, forming, stamping, staking, crimping, flaring, riveting, and many other operations. Multipress is built in both bench and floor models; one-ton to 75-ton capacities. Manual or automatic controls for any requirement. Standard Multipress accessories available for many specialized operations. Send for a copy of "MULTIPRESS, and how YOU can use it" or write for information covering your specific needs. There's no obligation.

The DENISON Engineering Company, 1152 Dublin Road, Columbus 16, Ohio



# POP'S School of Filing



THE "language of files and filing" is a necessary part of every good mechanic's education—whether he is "majoring" in a specialized type of operation or is assigned to miscellaneous work around the shop. The days of haphazard file selection and filing techniques are gone in modern shop practices. Parts finishing, assembling and fitting must take into account diversity of metals, degree of accuracy—and the speed necessary to keep production costs within bounds.

Nicholson file engineers study all these factors and design files with tooth shapes, angles, sharpness and hardness to fit specific metals, methods and end results. With Nicholson, making files is a science.

**If your Industrial Distributor handles Nicholson or Black Diamond brand files, he is well equipped to give your production heads helpful technical suggestions.**

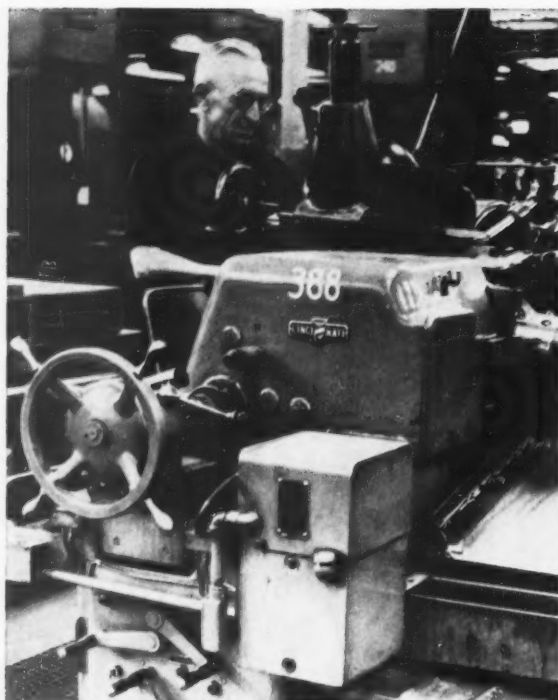
**ABOVE**—The Nicholson (or Black Diamond) Long Angle Lathe File. While the ordinary Mill file is normally capable of doing good lathe filing, the Long Angle Lathe file—with teeth angle increased to 45°—does faster and smoother work. The chips slide down the longer angle and there is less tendency of "pinning up" and scratching surface being smoothed.



NICHOLSON FILE CO. • 18 ACORN ST. • PROVIDENCE 1, RHODE ISLAND  
(In Canada, Port Hope, Ont.)



## NICHOLSON FILES FOR EVERY PURPOSE



**LONGER MACHINE LIFE** and more efficient service—because this unseen G-E process timer gives precise, dependable control.



**AUTOMATIC PROCESS CONTROL** permits operating an oil pump for a predetermined percentage of machine operating time.

## G-E Process Timer Provides Automatic Machine Oiling, Boosts Operator Output, Increases Apparatus Life

One example of the precise control provided by this Telechron\* powered timer is in the application shown above. Here the TSA-14 process timer controls a motor and a pump, which in turn supply oil to various parts of the machine. Because of automatic—rather than manually controlled—lubrication, the operator's output is measurably increased, machine life is prolonged, and shut-down time for repairs is reduced to a minimum.

### MANY APPLICATIONS

"Stopwatch accuracy"—that's how the controlling accuracy of the TSA-14 process timer is described. This preset control provides exact on or off timing for machine operations. Applications for the TSA-14 range from pumping control to the accurate timing required by chemical processes.

### FOR MORE INFORMATION

Write or call your nearest G-E Apparatus Sales Office, or Authorized Agent or Distributor. Ask for Bulletin GEC-525. General Electric Company, Schenectady 5, N.Y. 603-151

\*Reg. Trade-mark of the General Electric Co.

*You can put your confidence in—*

**GENERAL  ELECTRIC**

324—MACHINERY, September, 1953

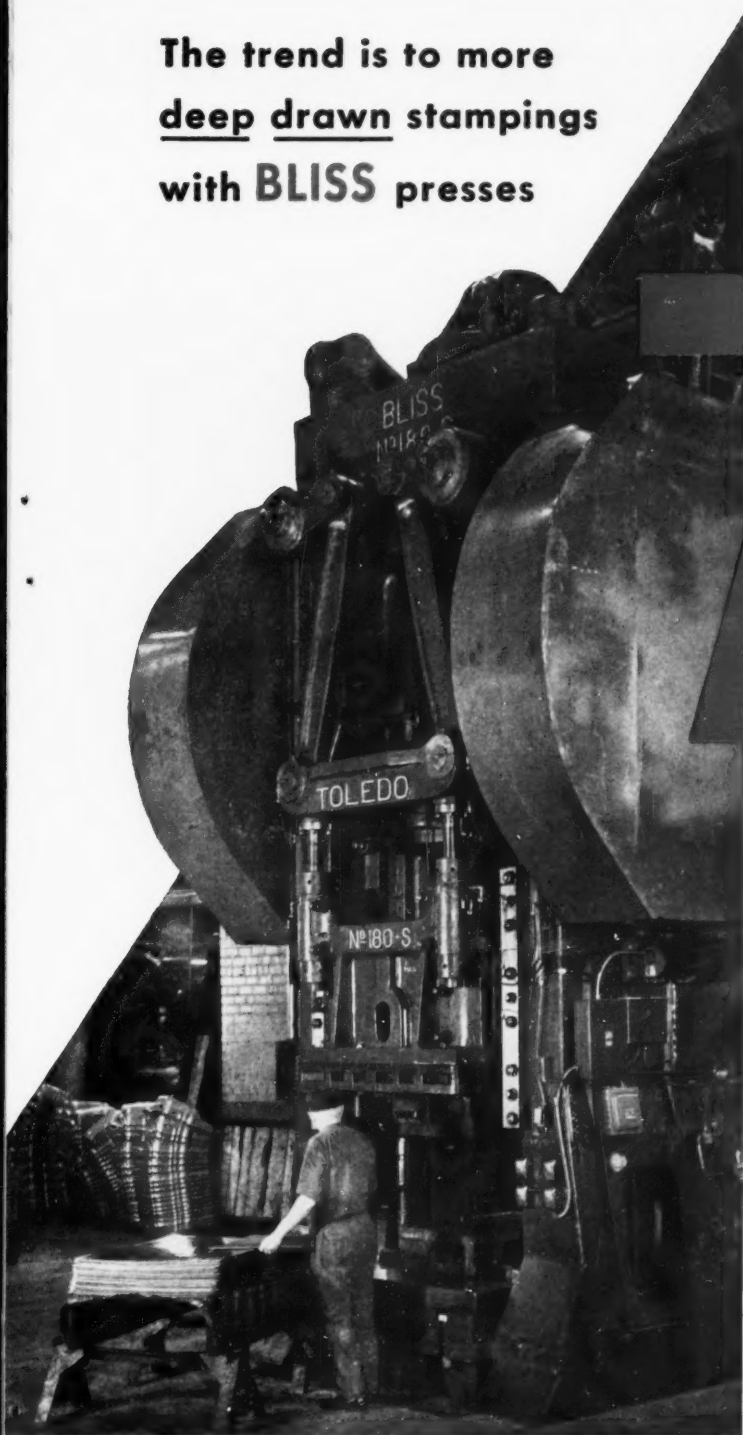


**EASY INSTALLATION** is yours with the TSA-14, which is equipped with pipe nipple for easy mounting and flexible leads with color code for simplified wiring. Write for your descriptive publication today!

For more information on products advertised, use Inquiry Card, page 239



The trend is to more  
deep drawn stampings  
with **BLISS** presses



*Bliss 650-Ton Single-Crank Toggle Drawing Press, latest addition to Transue & Williams' press room, is producing deep drawn stampings at rate of five strokes per minute.*

# 74%

of presses at  
**Transue & Williams**  
are **BLISS-built!**

As specialists in deep drawn parts, Transue & Williams of Alliance, Ohio, require dependable and specialized production facilities to make full use of their widely-recognized designing ability. So it's significant that they depend largely on Bliss for presses.

Of the 35 presses in the T & W shop, 26—or 74%—are Bliss-built. And practically all the larger presses, including a new 650-ton draw press, are of Bliss manufacture.

Transue & Williams average nearly 200 deep draws an hour on their Bliss presses. For *extremely deep* draws, they find that a particularly valuable feature of these presses is the combination of hydro-pneumatic die cushion and positive knockout in the bed.

The outstanding advantages Transue & Williams get in Bliss drawing presses result from Bliss' long experience in building this type of equipment. *Whatever* type of press you need, why not call in a Bliss engineer? You'll find that Bliss builds it—and builds it better.

**E. W. BLISS COMPANY, CANTON, OHIO**

E. W. Bliss (England) Ltd., Derby, England

E. W. Bliss Company (Paris), St. Ouen sur Seine, France

**PRESSES, ROLLING MILLS, SPECIAL MACHINERY**

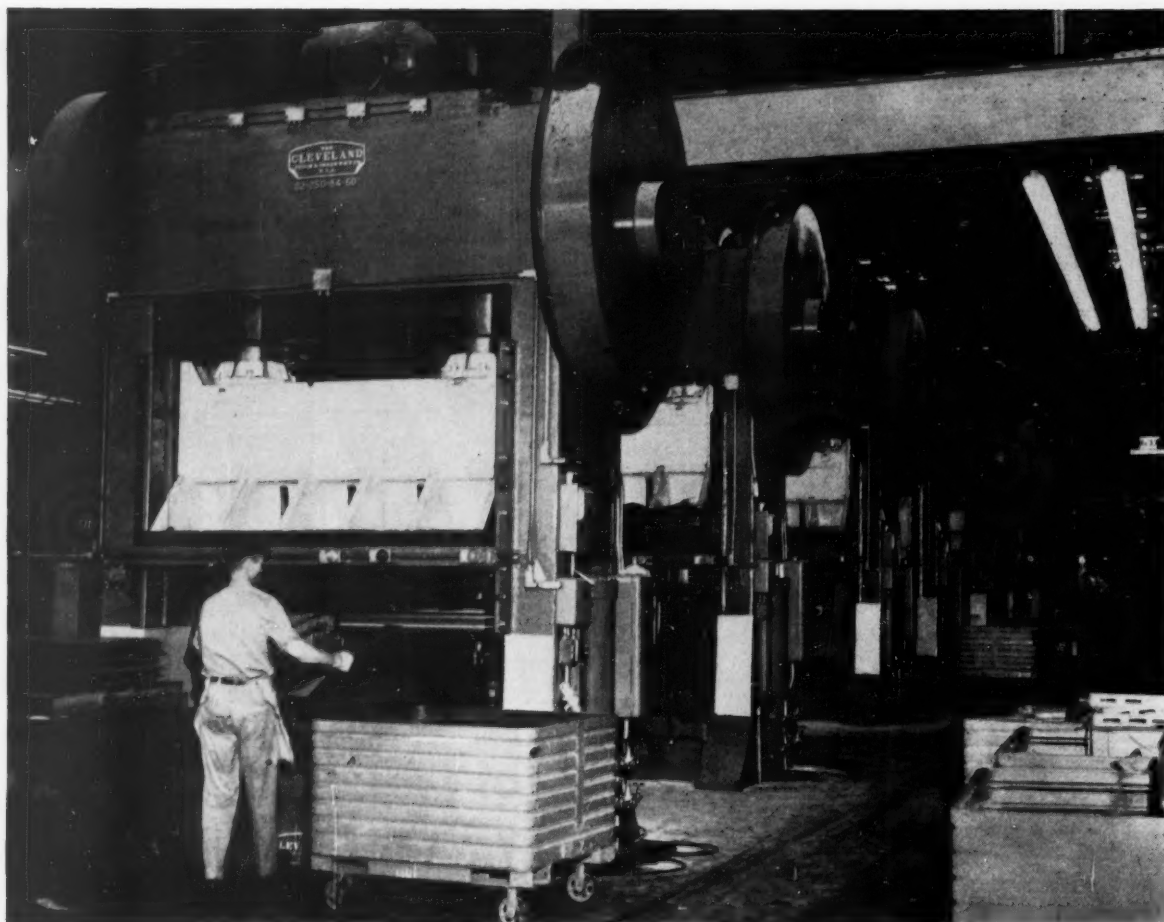
*U. S. plants at Canton, Salem, Toledo, Ohio; and Hastings, Michigan*

*Branch offices in Chicago, Cleveland, Dayton, Detroit, Indianapolis, New Haven, New York, Philadelphia, Rochester, Toledo; and Toronto, Canada. West Coast Representatives: Moore Machinery Co., Los Angeles and San Francisco; Star Machinery Company, Seattle. Other dealers in United States cities and throughout the world.*

## BLISS

**ON YOUR PRESS IS MORE THAN  
A NAME...IT'S A GUARANTEE!**





## CLEVELAND PRESSES FORM RANGE TOPS FOR GENERAL ELECTRIC

These 8 new Cleveland Presses, are now in operation at Appliance Park, Louisville, Kentucky, General Electric's new appliance center, producing parts for famous General Electric ranges.

We're proud that Clevelands were chosen for this new press battery. Their selection resulted from General Electric's constant search for increased effi-

ciency through improved equipment and methods. All of these presses are equipped with the Cleveland (patented) Drum Type Clutch.

If you, too, need greater press efficiency, you can't afford to overlook the economies and production advantages offered by Cleveland Presses. They are made in a complete range of types, sizes and capacities, so you can be sure of getting the exact press for your particular requirements. Why not call a Cleveland representative? He'll gladly study your needs and after consulting with our engineers, he'll give you figures that we're sure you'll find interesting.

A 7907



**THE CLEVELAND PUNCH & SHEAR WORKS COMPANY**

CLEVELAND 14 • OHIO

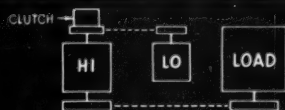
NEW YORK • CHICAGO • DETROIT • PHILADELPHIA • E. LANSING

# FORMSPRAG

## FULL COMPLEMENT

# Clutches

### OVER-RUNNING



**Typical Arrangement:**

Drive is transmitted through clutch during low speed cycle. Clutch over-runs during high speed cycle.

### INDEXING



**Typical Arrangement:**

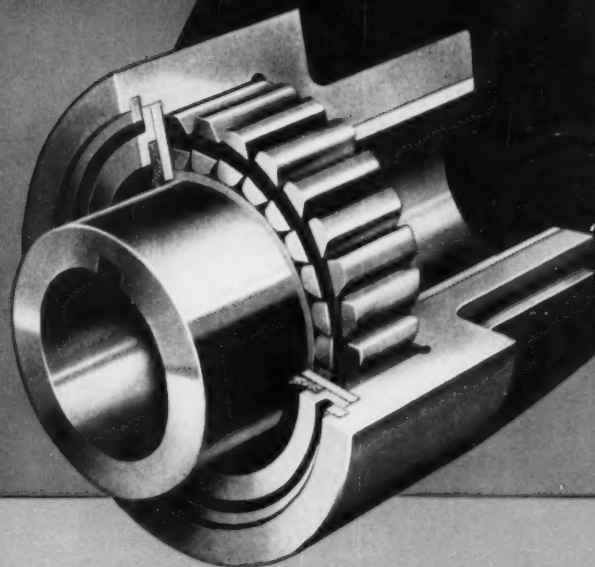
Continuous rotary motion of crank A produces oscillation of arm B. Attached to outer race (or in some cases, the inner race) of clutch, arm B produces intermittent forward rotation of shaft C.

### BACKSTOPPING



**Typical Arrangement:**

One race of clutch is attached to stationary member and other race is attached to rotating part of mechanism. Clutch permits rotation in one direction, but not in reverse.



**Formsprag Clutches are ALL Full Complement Clutches**

Their energized sprags grip at an infinite number of positions, giving instantaneous operation—no backlash—and long life because of low unit stresses . . . Before you specify another clutch be sure to read this folder.



#### FORMSPRAG COMPANY

23609 Hoover Rd., Van Dyke, Mich.

Send the folder to:

NAME \_\_\_\_\_

TITLE \_\_\_\_\_

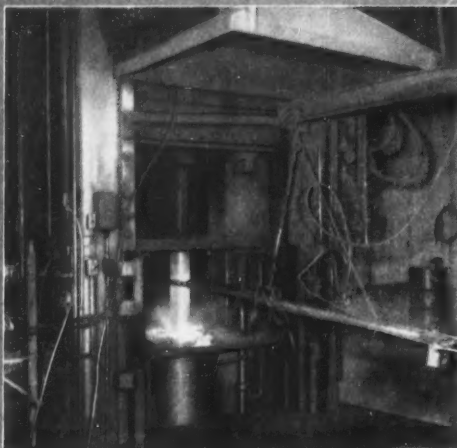
COMPANY \_\_\_\_\_

ADDRESS \_\_\_\_\_

Your inquiries about  
Formsprag and  
Cagedsprag  
Over-Running  
Clutches are  
welcomed by the  
Formsprag  
Company.

**DISTRIBUTORS IN  
PRINCIPAL CITIES**

MASS PRODUCTION of projectiles  
with **Verson** PRESSES  
AND TOOLING  
for greater production  
and lower costs!



Piercing a steel billet in a 600 ton Verson hydraulic press.



Here a Verson hydraulic push through press sizes the cavity and O.D. of the steel forging.

**A**MONG the many advancements in the press forming of metals that have been pioneered by Verson in recent years are new, improved presses and tooling for producing artillery projectiles. Under the pressure of a combination military and civilian economy, Verson methods have resulted in substantial savings in metal and have made possible great increases in output without a corresponding increase in critical manpower.

Equally important strides have been made in civilian production, too, but tremendous opportunities for modernization and increased efficiency remain. We would like to have the opportunity to discuss press forming of metals with you and help you set up a plan that will enable you to take advantage of the many cost cutting opportunities that are becoming available.

Write, today, outlining your requirements.

A Verson Press for every job from 60 tons up.



ORIGINATORS AND PIONEERS OF ALLSTEEL STAMPING PRESS CONSTRUCTION

**VERSON ALLSTEEL PRESS CO.**

9309 S. KENWOOD AVENUE, CHICAGO 19, ILLINOIS • SO. LAMAR AT LEDBETTER DRIVE, DALLAS, TEXAS

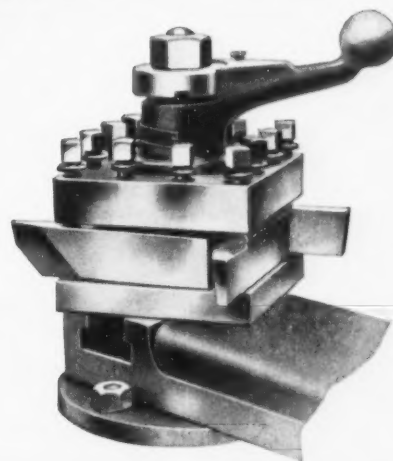
MECHANICAL AND HYDRAULIC PRESSES AND PRESS BRAKES • TRANSMAT PRESSES • TOOLING • DIE CUSHIONS • Verson-WHEELON HYDRAULIC PRESSES



# MCCROSKY

**COST  
CUTTING  
TOOLS**

## *Turret* **TOOL POSTS** give engine lathes the advantages of turret lathes



● The successive tools needed for multiple operation jobs can be swung into cutting position quickly — indexed accurately in any of 12 indexing positions — and locked rigidly when you use a McCrosky Turret Tool Post. Thus multiple tool jobs become continuous, enabling engine lathes to handle — efficiently and economically — a wide variety of work that otherwise would require a turret lathe or other specialized machine.

McCrosky Tool Posts are ruggedly built and provide the rigidity necessary for making heavy cuts. They feature many service-proved advantages,

available only in McCrosky design, that assure long, efficient, satisfactory operation. 5 different styles, including square and hexagon designs — 9 sizes — for mounting in the T-slot of the compound rest, or the bolt circle of the main slide. Used by leading concerns from coast to coast. **Endorsed by all well known lathe manufacturers.** Send for Bul. 17-T. It gives full details.

### **MCCROSKY**

#### *Universal* **MILLING CUTTERS**

Body can be bladed to rotate either right or left hand. Consequently, selecting blades with tips of proper material mounted at proper angles produces a cutter that meets any metal or machine condition. Write for Bulletin No. 531 today.



### **MCCROSKY**

#### *Super Adjustable* **REAMERS**

Complete line includes chucking reamers with straight or tapered shanks, shell reamers with tapered holes for standard arbors or large straight holes for line bar reaming. Stock sizes from 15/16" to 6" diameter. High speed, cast alloy or carbide tipped blades. Write for Bulletin 18-R.



### **MCCROSKY**

#### *Jack-Lock* **MILLING CUTTERS**

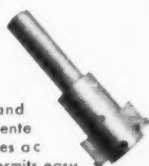
Face Mills, Shank and Shell End Mills, Half Side and Staggered Tooth Milling Cutters fitted with high speed steel, cast alloy or carbide tipped blades. Sizes from 3" to 24" in diameter to meet any requirement. Write for Bulletin No. 17-M.



### **MCCROSKY**

#### *Block Type* **BORING BARS**

Individually ground and hardened tapered V-key center the block and cutting blades accurately and rigidly yet permits easy release for regrinding, and "floating" with extreme accuracy when making finishing cuts. Wide range of stock sizes. Write for Bul. 17-B.



### **MCCROSKY**

#### *Wizard* **QUICK-CHANGE CHUCKS**

McCrosky's Wizard Quick-Change Chuck and Collet outfits hold tools centered and rigid. They enable the operator to change tools easily and quickly, without stopping or slowing down the spindle. Successive operation jobs become continuous. Write for Bulletin 18-C.



### **MCCROSKY**

#### *Multiple Operation* **TOOLS**

McCrosky "Specials" combine two or more related boring, facing, chamfering or reaming operations into a single tool saving set-up time and cutting costs. Engineered by McCrosky to your work prints. Write for Bulletin 17-S



# MCCROSKY

**TOOL  
CORPORATION**  
MEADVILLE, PA.

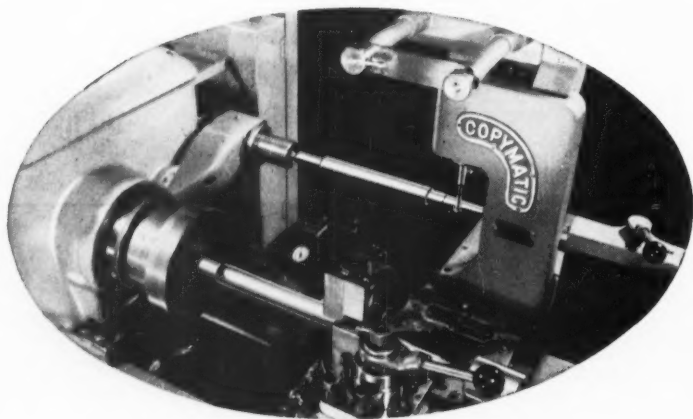
Engineering and Sales Representatives in the Principal Cities





## full course or short orders

WITH A LODGE & SHIPLEY COPYMATIC



What's on your lathe work "menu"?

"Short order" limited runs, 5 or 25 pieces?

"Full course" turning production, 500 or more pieces?

Or both? Here's the lathe that satisfies any production "appetite."

For example, Leland Electric Co., Division of American Machine & Foundry Co., finds the COPYMATIC "the answer to short order lathe turning . . . saves 8 hours per day . . . 1 man's salary per year!" On large runs, users report production increases up to 536%.

Reports on jobs comparable to yours are available in case histories together with NEW descriptive Bulletin No. 675. Write for your copies.



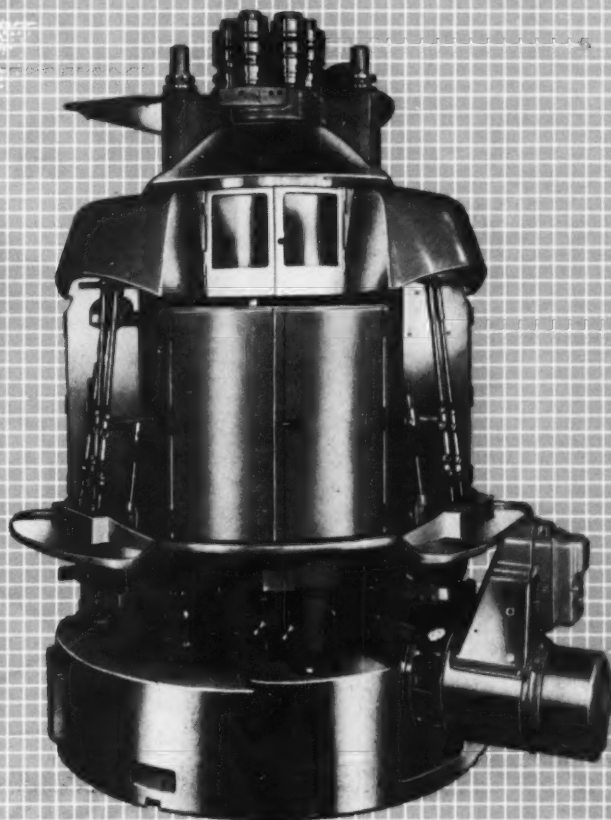
3063 COLERAIN AVE., CINCINNATI 25, OHIO

For more information on products advertised, use Inquiry Card, page 239

# **TAYANNES GYROMATIC**

## **VERTICAL**

SIX ROTATING SPINDLES  
SIX TOOL SLIDES  
AUTOMATIC LOADING

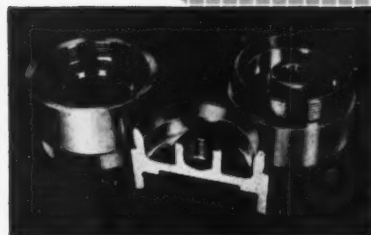


## **AUTOMATIC CHUCKING MACHINE**

*Instrument Accuracy*



**CHROME-NICKEL FORGING**  
Interrupted Cut



**ALUMINUM DIE CASTING**  
Single Point Automatic Threading

# **RUSSELL, HOLBROOK & HENDERSON, INC.**

292 Madison Avenue, New York 17, N. Y.

# *Smith & Mills* PATENTED **SOLID RAM**



**PACKS THE PUNCH**

- .. to "rough" with ease
- .. to finish with precision
- .. to speed your production
- .. to please your operators

This exclusive Smith & Mills Solid Ram is only one of the recent progressive engineering developments which have made both management and operators prefer Smith & Mills Shapers . . . just as they have for 64 years.

*The* **Smith & Mills COMPANY**

affiliated with Bryant Machinery & Engineering Company  
General Office: 640 W. Washington Blvd., Chicago 6  
EXCLUSIVE REPRESENTATIVES THROUGHOUT THE WORLD

Fine Shapers  
since 1888

# SUNNEN HONING

- SPEEDS MACHINE ASSEMBLY
- SIMPLIFIES FIELD MAINTENANCE



## PROBLEM:

Hold close hole tolerance and good surface finish on button-hole machine part, to provide perfect interchangeability for easy assembly of new machines and repair in the field.

**MATERIAL:** Aluminum Alloy, SAE26.

**HOLE DIAMETER:** 11/32"

**HOLE LENGTH:** 1.0"

**STOCK REMOVAL:** .0003" to .0005"

**FINISH:** 16 Micro-inches

**TOLERANCE:** .3438" to .3442"

**MANUFACTURER:** Reece Corp., Waltham, Mass.

## SOLUTION:

Sunnen Model MBB-1290 Honing Machine with Standard K10 type mandrel and honing stone, plus Sunnen Honing Oil.

## RESULTS:

110 parts per hour—virtually no rejects. Sunnen Honing has proved the most practical way to manufacture these parts at a cost that is competitive. This method was so successful that Reece has designed many other parts specifically for honing.

## OTHER PARTS HONED AT REECE CORP.



## SUNNEN PRODUCTS COMPANY

7991 Manchester Avenue, St. Louis 17, Missouri  
Canadian Factory: Chatham, Ontario



In plant after plant Sunnen Honing Machines have been the solution to production problems that could not be handled by drilling, reaming, boring, lapping, or grinding.

You'll find them economical for job lots as well as long production runs... for de-burring as well as micro-fitting... for producing holes to engineering specifications as well as for eliminating manufacturing bottlenecks.

These machines generate geometrically perfect holes with fast stock removal... produce a guaranteed accuracy of .0001" or better and surface finish to 2 micro-inches RMS... have a diameter range of 1/8" to 2 3/8"... require no jigs or fixtures... are used in thousands of plants in production, tool room, maintenance, salvage. Average installation costs less than \$1,000.

Sunnen Honing Machines may be *your* answer, too. Investigate now.

Mail the  
Coupon NOW  
for this  
Free  
Booklet



## Sunnen Products Co.

7991 Manchester Ave., St. Louis 17, Missouri

☐ Send Free Booklet on Sunnen Honing

☐ Have A Field Engineer Call, no obligation

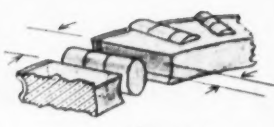
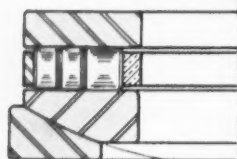
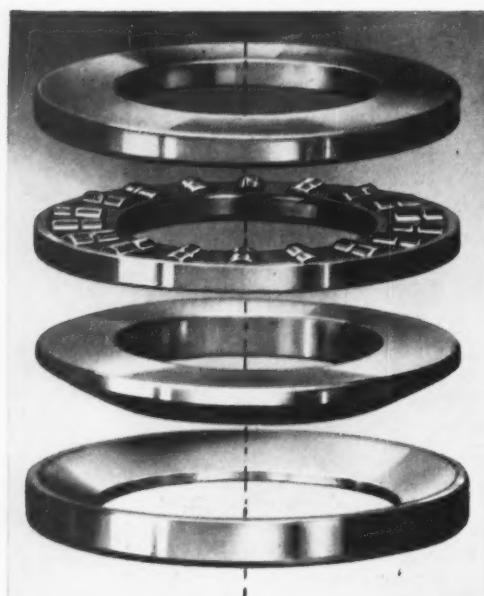
Name.....

Company.....

Address.....

City..... Zone..... State.....





PARALLELISM

ACCURATE PARALLELISM between the rollers and the matched thrust plates is repeated in the parallelism between the separator slots and the rollers themselves—all adding up to quietness, equalized wear and longer life.

**THRUST  
RADIAL**



**RIGHT ANGLE**  
Roller Ends, precisely square to avoid end-rub, oscillation and side-shock.



● **RIGHT ANGLE**  
Bearing Surfaces with parallelism that results in unwavering right-line rolling.



● **RIGHT ANGLE**  
Separator Slots accurately machined to prevent roller skew, slide and uneven wear.

Held to extremely close limits of parallelism, every roller—every race—every thrust plate in a Rollway Bearing is an engineering masterpiece of matched precision and right-angle trueness. As a result, friction losses are low—load capacity and service life high.

Rollway Radial and Thrust Bearings offer the widest selection in types and sizes, available for quick replacement through authorized distributors. Consult your classified phone directory under BEARINGS.

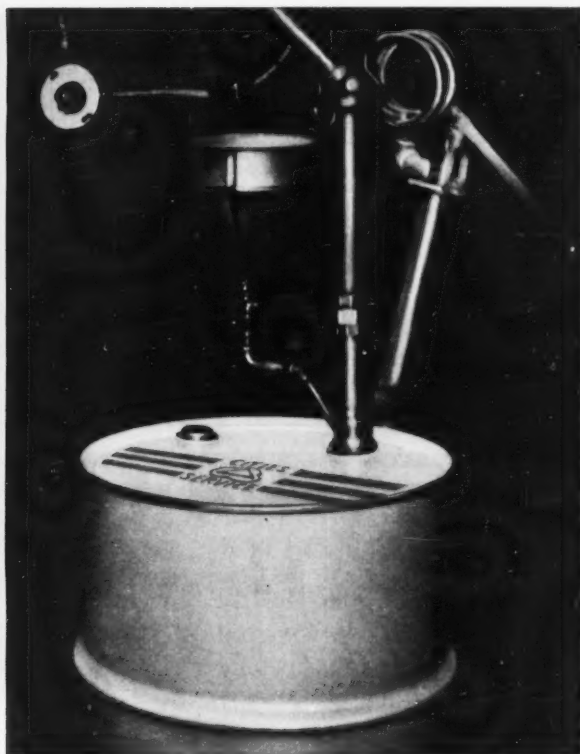
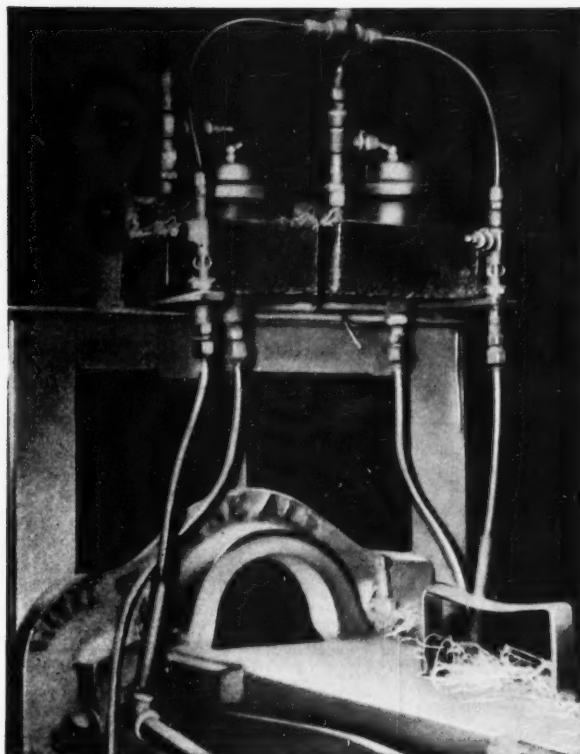
Our engineers are available without cost or obligation to assist you in selecting the correct Rollway Bearing for your needs. Call your nearest Rollway sales office, or write Rollway Bearing Co., Inc., Syracuse, N. Y.

#### SALES OFFICES

|            |              |
|------------|--------------|
| Syracuse   | Houston      |
| Cleveland  | Chicago      |
| Detroit    | Philadelphia |
| Boston     | Toronto      |
| Pittsburgh | Los Angeles  |
| Milwaukee  |              |

# ROLLWAY BEARINGS

Complete Line of Radial and Thrust Cylindrical Roller Bearings



**CENTRALIZED LUBRICATION SYSTEM** proves to be time and money-saver for American Excelsior Company. Drum of lubricating oil is connected to main supply line which feeds oil to each machine by means of main pump and individually adjusted oilers.

# Cities Service Raven Oils Fight Fire Hazard for American Excelsior

## **CENTRALIZED LUBRICATION SYSTEM WITH CITIES SERVICE RAVEN OILS WORKS FOR WISCONSIN COMPANY!**

Like so many other alert manufacturing organizations, American Excelsior Company, Oshkosh, Wisconsin, relies on a centralized lubricating system for most effective and economical lubrication in their operation. (See picture caption.)

And another great time and money saver has been the Cities Service Raven Oils they use. In an excelsior operation, fire is a major hazard, but with Raven Oils, (high flash point) American Excelsior gets maximum

lubrication AND maximum protection against fire!... Another outstanding example of how Cities Service lubricants can solve complicated lubricating problems.

Perhaps you have a particularly bothersome lubricating problem. Why not turn it over to a Cities Service Lubrication Engineer for the answer that will mean money and time saved for you? Contact the Cities Service office nearest you, or write Cities Service Oil Company, Dept. I—12, Sixty Wall Tower, New York 5, New York.



For more information on products advertised, use Inquiry Card, page 239

MACHINERY, September, 1953—335

# Product Directory

To find headings easily, look for capital letters at top of each page to denote locations.

## ABRASIVE CLOTH, Paper and Belt

Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.  
Waits Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

## ABRASIVE DISCS

See Discs, Abrasive

## ABRASIVES, HONING

Barnes Drill Co., 814 Chestnut St., Rockford, Ill.

## ABRASIVES, Polishing, Tumbling, Etc.

Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.  
DoAll Co. 254 Laurel Ave., Des Plaines, Ill.  
Norton Co., 1 New Bond St., Worcester 6, Mass.  
Simonds Abrasive Co., Tacony and Fraley Sts., Bridesburg, Philadelphia, Pa.

## ACCUMULATORS, Hydraulic

American Steel Foundries, Elmes Engineering Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.

Baldwin-Lima-Hamilton Corp., Philadelphia, Pa.  
Bethlehem Steel Co., Bethlehem, Pa.  
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.  
Lake Erie Engrg. Corp., Kenmore Sta., Buffalo, N. Y.  
Morgan Engineering Co., Alliance, Ohio.  
Vickers, Inc., 1402 Oakman Blvd., Detroit, Mich.  
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.  
Wood, R. D., Co., Public Ledger Bldg., Philadelphia 5, Pa.

**AIR HOISTS**—See Hoists, Air.

**AIR TOOLS**—See Grinders, Pneumatic; Drills, Portable Pneumatic, Etc.

## ALLOY STEELS

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.  
Bethlehem Steel Co., Bethlehem, Pa.  
Carpenter Steel Co., Reading, Pa.  
Crucible Steel Co. of America, Chrysler Bldg., New York 1, N. Y.  
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.  
Republic Steel Corp., Union Drawn Steel Div., Republic Bldg., Cleveland, Ohio.  
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.  
U. S. Steel Corp., Carnegie-Illinois Steel Corp. Div., 436 7th Ave., Pittsburgh, Pa.  
Vanadium Alloys Steel Co., Latrobe, Pa.  
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.

## ALLOY STEELS, High Temperature

Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.

## ALLOYS, Aluminum

Aluminum Co. of America, Oliver Bldg., Pittsburgh, Pa.

## ALLOYS, Magnesium

Dow Chemical Co., Midland, Mich.

## ALLOYS, Non-Ferrous

American Brass Co., 25 Broadway, New York.  
Chase Brass & Copper Co., Inc., 1949 Rodney St., Waterbury 20, Conn.  
Havnes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.  
Revere Copper & Brass Inc., 230 Park Ave., New York, N. Y.

## ARBOR PRESSES

See Presses, Arbor

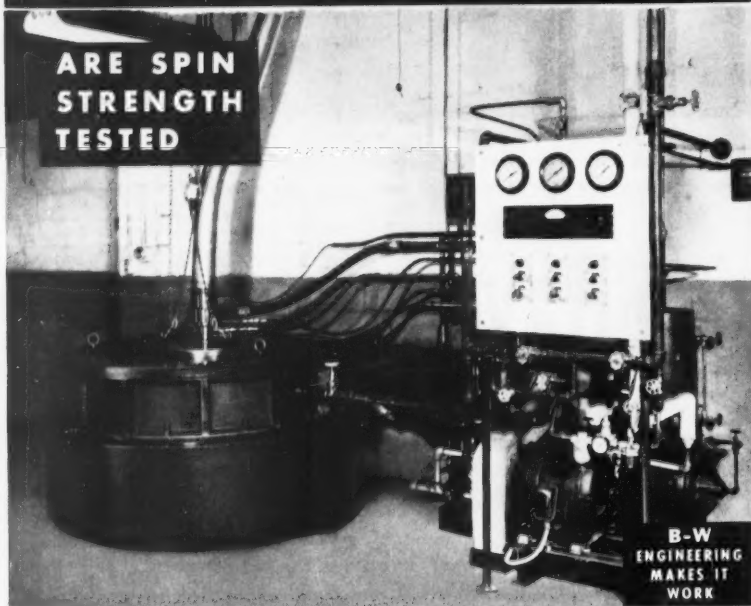
## ARBORS AND MANDRELS

Beaver Tool & Engineering Corp. (Arbors, only), 2850 Rochester Rd., Box 429, Royal Oak, Mich.  
Brown & Sharpe Mfg. Co., Providence, R. I.  
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.  
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.  
Danly Machine Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.  
Erickson Tools, Div. Erickson Steel Co., 2309 Hamilton, Cleveland, Ohio.  
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.  
Gorton, George Mch. Co., 1110 W. 13th St., Racine, Wis.  
Jacobs Mfg. Co., West Hartford, Conn.  
Kempsmith Machine Co., 1819 S. 71st St., Milwaukee 14, Wis.  
Keo Cutters, 19326 Woodward, Detroit, Mich.  
Morse Twist Drill & Mch. Co., New Bedford, Mass.  
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.  
National Twist Drill & Tool Co., Rochester, Mich.  
Pratt & Whitney, West Hartford 1, Conn.  
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.  
Union Twist Drill Co., Athol, Mass.  
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.  
Western Tool & Mfg. Co., 1640 E. Wheeler St., Springfield, Ohio.  
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

(Continued on page 338)

# ROCKFORD CLUTCHES

ARE SPIN  
STRENGTH  
TESTED



To determine the bursting speed of ROCKFORD CLUTCHES, they are spun up to a high R.P.M. in this air turbine speed chamber. This test assures they will continue to perform efficiently at the speeds for which they were designed. Let ROCKFORD engineers devote the benefit of this and many other tests to your product's clutch design.



B-W  
ENGINEERING  
MAKES IT  
AVAILABLE

## ROCKFORD CLUTCH DIVISION

410 Catherine Street, Rockford, Illinois, U.S.A.

BORG.  
WARNER

# You Can Get These SHELL MOLDING Benefits...

Higher percentage of sound, uniform castings that cuts rejects.

Casting surfaces almost pattern-smooth.

Pieces cast to closer finished dimensions—tolerances as close as .003 to .005 inches per inch.

Reduced machining on intricate, complex shapes.



## When Your Foundry Uses the New **BAKELITE** RESIN TRADE-MARK Described in this Bulletin...

BAKELITE General-Purpose Resin BR-12011S has been specially developed to give greater latitude in mold-making. It can be subjected to a greater variation in operating conditions than ordinary shell molding resins. Shell molds reach minimum usable strength faster and retain strength longer at curing temperatures, permitting more leeway in curing time.

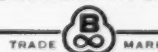
Shell molds made with this resin resist the tendency to distort upon ejection from the hot pattern plate, insuring better mating of mold halves. The molds also offer greater resistance to deformation during the pouring operation, resulting in castings that are more dimensionally accurate.



## Specify Castings made by SHELL MOLDING

Modernize your production methods with castings made by the shell molding process. Ask your foundry department or foundry supplier to write for data on BAKELITE Phenolic Resin BR-12011S. Address inquiries to Dept. RD-19.

**BAKELITE**  
TRADE-MARK  
**PHENOLIC RESINS**  
**FOR SHELL MOLDING**



**BAKELITE COMPANY**  
*A Division of*  
**Union Carbide and Carbon Corporation**

**30 East 42nd Street, New York 17, N. Y.**

*In Canada:*  
**Bakelite Company (Canada) Ltd., Belleville, Ont.**



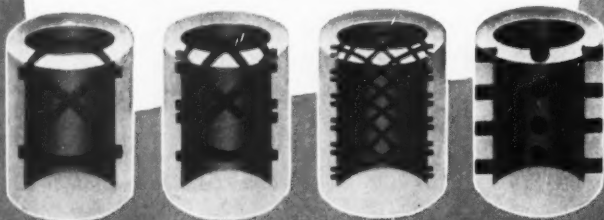
# JOHNSON GRAPHITED BEARINGS FOR MANY SPECIAL USES

**JOHNSON GRAPHITED CAST BRONZE SLEEVE BEARINGS** were developed primarily for applications where lubrication is difficult or likely to be neglected. Another important use is where the shaft speed is too slow or the temperature too low to sustain an oil film; also where high operating temperatures may burn out oils and greases. They are recommended where lubricants might damage goods or foods in process, where dripping oil cannot be tolerated, and in certain underwater applications. Johnson Graphited Bearings are available in three types: with serrated grooves, with graphite plugs, and with graphite-filled oil grooves. The serrated type is a stock item in over 200 sizes, available through Johnson Distributors. Write for full information.

**JOHNSON BRONZE COMPANY,**  
520 South Mill Street, New Castle, Pa.

## JOHNSON BEARINGS *Sleeve & Type*

**OTHER JOHNSON BEARING TYPES:** General Purpose (GP) • Electric Motor (EM) • Self-lubricating Powder Metallurgy • Universal Bronze Bars • Babbitt



SLEEVE BEARING HEADQUARTERS  
SINCE 1901

### BABBITT

Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.  
Johnson Bronze Co., New Castle, Pa.  
Ryerson Jos. T. & Son, 2558 W. 16th St., Chicago 18, Ill.

### BALANCING EQUIPMENT

Anderson Bros. Mfg. Co., 1910 Kishwaukee St., Rockford, Ill.  
Cosa Corp., 405 Lexington Ave., New York 17.  
Gisholt Machine Co. (Static and Dynamic), 1245 E. Washington Ave., Madison 10, Wis.  
Keller Tool Co., Grand Haven, Mich.  
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.  
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.  
Pope Machinery Corp., Haverhill, Mass.  
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.  
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.  
Thor Power Tool Co., Aurora, Ill.  
Westinghouse Electric Corp., Pittsburgh 30, Pa.

### BALLS

Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.  
Kennametal, Inc., Latrobe, Pa.  
S K F Industries, Inc., P. O. Box 6731, North Philadelphia, Pa.

### BARS, Phosphor Bronze

Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.  
Johnson Bronze Co., New Castle, Pa.

### BARS, Steel

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.  
Bethlehem Steel Co., Bethlehem, Pa.  
Carpenter Steel Co., Reading, Pa.  
Crucible Steel Co. of America, Chrysler Bldg., New York, N. Y.  
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.  
Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.  
LaSalle Steel Co., Hammond, Ind.  
Republic Steel Corp., Union Drawn Steel Div., (Cold Drawn), Republic Bldg., Cleveland, Ohio.  
Ryerson, Joseph T. & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.  
Summerill Tubing Co., Div. Columbia Steel & Shafting Co., P. O. Box 1557, Pittsburgh 30, Pa.  
Timken Roller Bearing Co., Canton, Ohio.  
U. S. Steel Corp. (American Steel & Wire Co. Div., Carnegie-Illinois Steel Corp. Div., Columbia Steel Co. Div., Tennessee Coal, Iron & R. R. Co. Div.), 436 7th Ave., Pittsburgh, Pa.  
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.

### BASES, Machinery Welded

Mahon R. C., Co., 6565 E. 8 Mile Rd., Detroit 34, Mich.

### BEARINGS, Babbitt

Bunting Brass & Bronze Co., Spencer and Carlton Ave., Toledo, Ohio.  
Johnson Bronze Co., New Castle, Pa.  
Link-Belt Co., 2410 W. 18th St., Chicago 8, Ill.

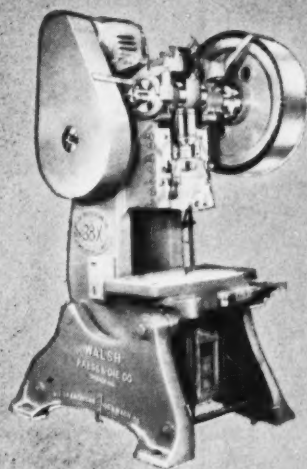
### BEARINGS, Ball

Aetna Ball & Roller Bearing Co., 4612 Schubert Ave., Chicago, Ill.  
Ball & Roller Bearing Co., Danbury, Conn.  
Boston Gear Works, 3200 Main St., North Quincy, Mass.  
C & C Sales Corp., 1771 Broadway, New York 19, N. Y.  
Fafnir Bearing Co., New Britain, Conn.  
Kaydon Engineering Corp., McCracken St., Muskegon, Mich.  
Link-Belt Co., 519 N. Holmes Ave., Indianapolis 6, Ind.  
Marlin-Rockwell Corp., 402 Chandler Bldg., Jamestown, N. Y.  
Nice Ball Bearing Co., Nicetown, Philadelphia, Pa.  
S K F Industries, Inc., P. O. Box 6731, North Philadelphia, Pa.  
Torrington Co., Torrington, Conn.

### BEARINGS, Bronze and Special Alloy

Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.  
Havnes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.  
Johnson Bronze Co., New Castle, Pa.  
Link-Belt Co., 2410 W. 18th St., Chicago 8, Ill.

(Continued on page 340)



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### Rugged as the Rockies

Some made in 1907 with rugged dependability are still operating at a profit.

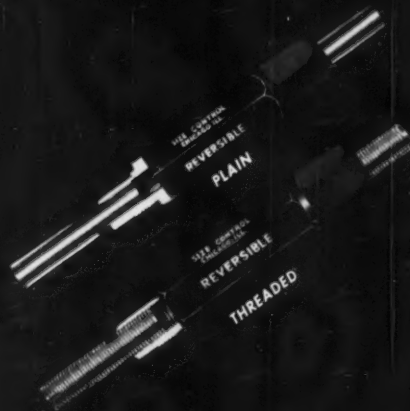
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... give you 5 or more gages for the price of one—reversible and extra length for new gaging surfaces at no additional cost.

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SIMPSON ELECTRIC COMPANY SIZE CONTROL COMPANY

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For more information on products advertised, use Inquiry Card, page 239

MACHINERY, September, 1953—339

# SPEEDY Zagar-Broaching

CLOSER HOLE TOLERANCES

36" HORIZONTAL  
2 WORKHEADS

ACCURATE  
KEYWAYS

STANDARD  
20" HORIZONTAL  
ALSO HIGH SPEED  
MODEL

LOW COST

10" VERTICAL

• Singly or in production lines, three Zagar broaching machines broach small and medium size parts with eye-opening speed and accuracy. Profitable uses: keyways in gears, hubs and pulleys; hexes, squares and irregular holes; sizing holes to close tolerances. Simple, fast, easy to learn; costs little to buy, little to operate. May we study your needs?

Write for Engineering Manual "M-9"

**Zagar**

TOOLS FOR INDUSTRY  
and SPECIAL MACHINERY

**ZAGAR TOOL, INC.**  
24000 LAKELAND BLVD.  
CLEVELAND 23, OHIO

## BEARINGS, Lineshaft

Fafnir Bearing Co., New Britain, Conn.  
Link-Belt Co., 519 N. Holmes Ave., Indianapolis 6, Ind.  
Shafer Bearing Corp., Downers Grove, Ill.  
S K F Industries, Inc., P. O. Box 6731, North Philadelphia, Pa.  
Orange Roller Bearing Co., Inc., Orange, N. J.  
Standard Pressed Steel Co., Jenkintown, Pa.

## BEARINGS, Needle

C & C Sales Corp., 1771 Broadway, New York 19, N. Y.  
Kaydon Engineering Corp., McCracken St., Muskegon, Mich.  
Orange Roller Bearing Co., Inc., Orange, N. J.  
Torrington Co., Torrington, Conn.

## BEARINGS, Roller

Aetna Ball & Roller Bearing Co., 4612 Schubert Ave., Chicago, Ill.  
Ball & Roller Bearing Co., Danbury, Conn.  
C & C Sales Corp., 1771 Broadway, New York 19, N. Y.  
Fafnir Bearing Co., New Britain, Conn.  
Hyatt Bearings Div., Harrison, N. J.  
Kaydon Engineering Corp., McCracken St., Muskegon, Mich.  
Link-Belt Co., 519 N. Holmes Ave., Indianapolis 6, Ind.  
Marlin-Rockwell Corp., 402 Chandler Bldg., Jamestown, N. Y.  
Orange Roller Bearing Co., Inc., Orange, N. J.  
Rollway Bearings Co., Inc., 541 Seymour St., Syracuse, N. Y.  
Shafer Bearing Corp., Downers Grove, Ill.  
S K F Industries, Inc., P. O. Box 6731, North Philadelphia, Pa.  
Timken Roller Bearing Co., Canton, Ohio.  
Torrington Co., Torrington, Conn.

## BEARINGS, Self-Lubricating (Oilless)

Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.  
Johnson Bronze Co., New Castle, Pa.

## BEARINGS, Tapered Roller

C & C Sales Corp., 1771 Broadway, New York 19, N. Y.  
Kaydon Engineering Corp., McCracken St., Muskegon, Mich.  
Timken Roller Bearing Co., Canton, Ohio.  
Torrington Co., Torrington, Conn.

## BEARINGS, Thrust

Aetna Ball & Roller Bearing Co., 4612 Schubert Ave., Chicago, Ill.  
Ball & Roller Bearing Co., Danbury, Conn.  
Boston Gear Works, 3200 Main St., North Quincy, Mass.  
Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.  
Fafnir Bearing Co., New Britain, Conn.  
General Electric Co., Schenectady, N. Y.  
Kaydon Engineering Corp., McCracken St., Muskegon, Mich.  
Link-Belt Co., 519 N. Holmes Ave., Indianapolis 6, Ind.  
Marlin-Rockwell Corp., 402 Chandler Bldg., Jamestown, N. Y.  
Nice Ball Bearing Co., Nicetown, Philadelphia, Pa.  
Orange Roller Bearing Co., Inc., Orange, N. J.  
Shafer Bearing Corp., Downers Grove, Ill.  
Timken Roller Bearing Co., Canton, Ohio.  
Torrington Co., Torrington, Conn.

## BELT SHIFTERS

Standard Pressed Steel Co., Jenkintown, Pa.

## BELTING TRANSMISSION

Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa.  
Link-Belt Co., 220 S. Belmont Ave., Indianapolis 6, Ind.

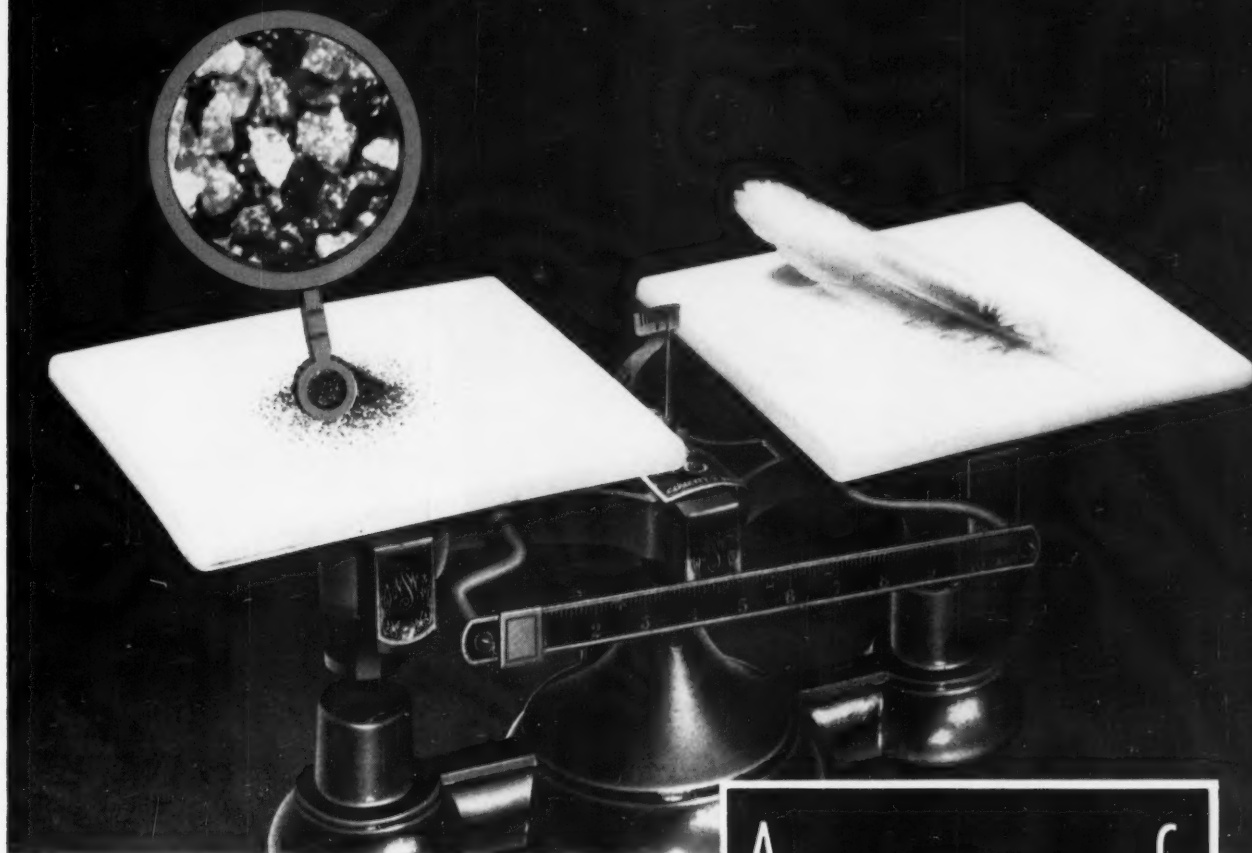
## BENCHES, Work, and Bench Legs

Standard Pressed Steel Co., Jenkintown, Pa.

## BENDING MACHINES, Angle Iron, Plate, Etc.

Consolidated Mch. Tool Corp., 565 Blossom Rd., Rochester, N. Y.  
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.  
O'Neil-Irwin Mfg. Co., Lake City, Minn.  
(Continued on page 342)





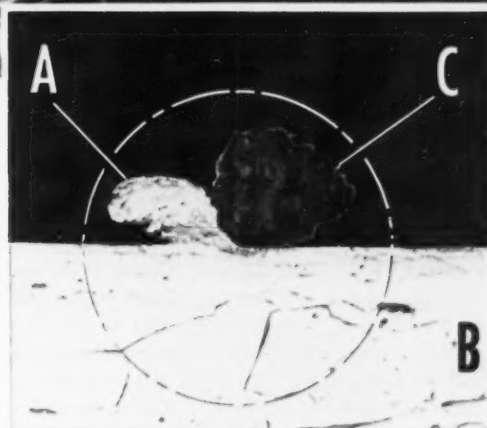
**SENSITIVE SCALE**, with feather balanced against pile of tiny grinding grits, shows that even a feather weighs more than these cutting tools.

## A FEATHER OUTWEIGHS THESE CUTTING TOOLS

Core of an entirely new approach to grinding wheels is the tiny grinding grit. Years of research by Cincinnati Milling has confirmed that grinding is a true chip cutting process.

Here is the starting point of development of the grinding wheel as a true cutting tool. Cincinnati Milling has developed and tested CINCINNATI GRINDING WHEELS over a period of several years as true cutting tools forming true chips.

Available to you is a field organization of trained machinists who know grinding and grinding machines as well as grinding wheels. For a demonstration on your own machines of how to get the most out of CINCINNATI GRINDING WHEELS, write, wire or phone Cincinnati Milling Products Division, The Cincinnati Milling Machine Co. Or, if you prefer, write for the free booklet "A New Concept In Grinding Wheels."



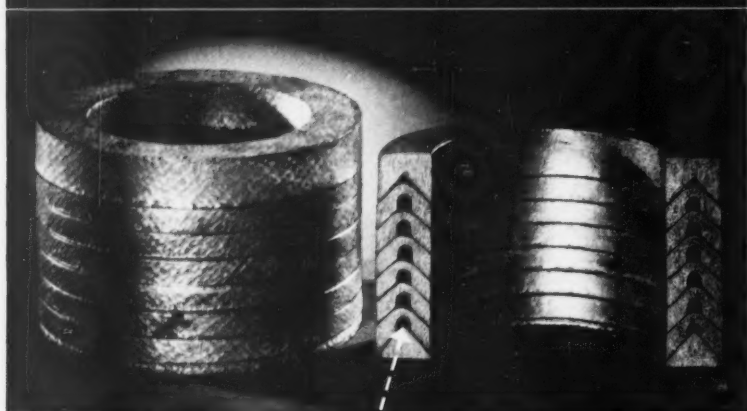
**FROZEN ACTION**—Tiny steel chip (A) is shown being cut from workpiece (B) by a grinding grit (C).



**EXPERIMENTAL WHEEL'S** performance is checked by member of research staff on one of several grinders in the Cincinnati Grinding Wheels Laboratory.



# CHEVRON<sup>\*</sup> PACKING



**Exclusive hinge-like construction assures a positive, low-friction seal**

At every pressure—from the lowest to the highest—Garlock CHEVRON packing provides a positive, low-friction seal. CHEVRON is ideally suited for use on hydraulic cylinders (both single-acting and double-acting), hydraulic rams, plungers of pumps and other reciprocating rods.

The exclusive hinge at the apex of each ring makes this packing flexible and sensitive to pressure changes. When the pressure is on, CHEVRON packing seals firmly both on the inside and outside edges. When the pressure is off, CHEVRON packing maintains a positive seal yet allows the ram or rod to return without binding. This automatic action not only prolongs the life of the packing but also increases the efficiency of the equipment on which it operates.

That is why many manufacturers of hydraulic cylinders, jacks, lifts and presses use Garlock CHEVRON packing exclusively.

Whether your job is plant maintenance or manufacturing new equipment, ask us about CHEVRON packing—the exclusive product of Garlock's own factories. Garlock CHEVRON packing is available in many materials such as: cotton duck with rubber or neoprene binder, asbestos with rubber or neoprene binder, hycar, "Teflon," and "Kel-F."

THE GARLOCK PACKING COMPANY, PALMYRA, NEW YORK  
In Canada: The Garlock Packing Company of Canada Ltd., Toronto, Ont.

Branch Offices in Most Principal Cities

<sup>\*</sup>Registered Trademark

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**PACKINGS, GASKETS, OIL SEALS,  
MECHANICAL SEALS, RUBBER EXPANSION JOINTS**



## BENDING MACHINES, Hydraulic

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.  
Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.  
Bethlehem Steel Co., Bethlehem, Pa.  
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.  
Chambersburg Engrg. Co., Chambersburg, Pa.  
Hamfin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.  
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.  
Lake Erie Engrg. Corp., Kenmore Sta., Buffalo, N. Y.  
Morgan Engineering Co., Alliance, Ohio.  
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.  
O'Neil-Irwin Mfg. Co., Lake City, Minn.  
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.  
Wood, R. D., Co., Public Ledger Bldg., Philadelphia 5, Pa.

## BENDING MACHINES, Pipe

Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.  
O'Neil-Irwin Mfg. Co., Lake City, Minn.  
Pines Engineering Co., Inc., Aurora, Ill. (Hydraulic)  
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

## BLAST CLEANING EQUIPMENT

Air Conversion Research Corp., 4107 N. Damen Ave., Chicago 18, Ill.  
Pangborn Corp., Hagerstown, Md.  
Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

## BLOWERS

Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.  
Ingersoll-Rand Co., Phillipsburg, N. J.  
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.  
Westinghouse Electric Corp., Pittsburgh 30, Pa.

## BLUING LAYOUT

Dykem Co., 2303 P. N. 11th St., St. Louis 6, Mo.

## BOILER TUBES

Bethlehem Steel Co., Bethlehem, Pa.  
Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.  
Republic Steel Corp., Steel and Tubes Div., Republic Bldg., Cleveland 1, Ohio.  
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.  
U. S. Steel Corp., National Tube Co., Div., 436 7th Ave., Pittsburgh, Pa.

## BOLT AND NUT MACHINERY

Ajax Mfg. Co., Euclid, Cleveland 17, Ohio.  
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.  
Landis Machine Co., Inc., Waynesboro, Pa.  
National Machinery Co., Tiffin, Ohio.  
New Britain Machine Co., New Britain-Gridley Mch. Div., New Britain, Conn.

## BOLTS AND NUTS

Aluminum Co. of America, Oliver Bldg., Pittsburgh, Pa.  
Bethlehem Steel Co., Bethlehem, Pa.  
National Acme Co., 170 E. 131st St., Cleveland, Ohio.  
Northwestern Tool & Engrg. Co., 117 Hollier, Dayton, Ohio.  
Ottemiller, W. H., & Co., York, Pa.  
Republic Steel Corp., Bolt & Nut Div., Republic Bldg., Cleveland 1, Ohio.  
Russell, Burdall & Ward Bolt & Nut Co., 100 Midland Ave., Port Chester, N. Y.

## BOLTS, T-Slot

O. K. Tool Co., Milford, N. H.  
Standard Shop Equipment Co., Inc., 8299 W. Tinicum Ave., Philadelphia, Pa.

## BOOKS, Technical

Industrial Press, 148 Lafayette St., New York 13, N. Y.  
Lincoln Electric Co., 22801 St. Clair Ave., Cleveland, Ohio.

## BORING AND DRILLING MACHINES

Baker Bros., Inc., Sta. F, P. O. Box 101, Toledo 10, Ohio.  
Barnes Drill Co., 814 Chestnut, Rockford, Ill.  
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.  
Bullard Co., Brewster St., Bridgeport 2, Conn.  
Canedy-Otto Div. Cincinnati Lathe & Tool Co., Oakley, Cincinnati, Ohio.

(Continued on page 344)

# famco

## OPEN BACK INCLINABLE POWER PRESSES



SOLENOID  
OPERATED  
CLUTCH

15 bench and floor models  
3 to 18 tons capacity. Left:  
Model 59 Electromatic 18  
Ton Press with exclusive  
solenoid operated clutch.

In an unusually short time Famco has become the nation's leading manufacturer of small O. B. I. presses. In addition to offering the largest line of precision-built presses on the market, Famco recently introduced the revolutionary Electromatic Clutch. This feature, built into its 13 and 18 Ton models, utilizes the instant action and increased efficiency of an electrically operated 9-point jaw clutch. Every care has been taken to make this the most rugged, highest quality line available. For complete details see your Famco Dealer or write for free Catalog.

### FAMCO MACHINE COMPANY

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KENOSHA, WISCONSIN

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FOOT PRESSES • POWER PRESSES • SQUARING SHEARS

# NOW, DUMORE DRILL HEAD

## makes every drill operator an expert!



THE new Dumore Automatic Drill Head does away with operator guesswork — the new *resistance drilling* way. High drill breakage losses are virtually eliminated by this remarkable new tool. It produces premium quality, small diameter deep holes, even with unskilled labor. And shop foremen report average drill life increases as much as 93 per cent.

Dumore's new *resistance drilling* automatically equalizes the exact pressure required for every stroke of the drill head . . . automatically compensates for variations in drill quality and workpiece hardness . . . factors your drill operators can't compensate for by sense of touch alone.

Depend on Dumore Automatic Drill Heads — and get big savings in drill costs, quality workmanship plus production increases.

Get all of the advantages of this remarkable shop tool. Ask your nearby industrial distributor for a demonstration, or write the Dumore Company.



Holes for airplane parts are produced 12 times faster at a 97% cost reduction with this setup. In fact, the Dumore Drill Head paid for itself after only 4½ hours operation.

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The Dumore Company

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Racine, Wisconsin

Consolidated Mch. Tool Corp., Rochester, N. Y.  
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.  
Foote-Burt Co., 1300 St. Clair Ave., Cleveland 8, Ohio.  
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.  
Moline Tool Co., 102 20th St., Moline, Ill.  
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.  
National Acme Co., 170 E. 131st St., Cleveland, Ohio.  
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.  
Turner Bros., Inc., 2625 Hilton Rd., Ferndale 20, Mich.

#### BORING AND TURNING MILLS, Vertical

American Steel Foundries King Mch. Tool Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.  
Bullard Co., Brewster St., Bridgeport 2, Conn.  
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.  
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.  
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.  
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.  
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.  
Triplex Machine Tool Corp., 75 West St., New York 6, N. Y.

#### BORING BARS

Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.  
Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.  
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.  
Beaver Tool & Engineering Corp., 2850 Rochester Rd., Box 429, Royal Oak, Mich.  
Bullard Co., Brewster St., Bridgeport 2, Conn.  
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.  
Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.  
Eclipse Counterbore Co., 1600 Bonner Ave., Ferndale, Mich.  
Erickson Tools, Div. Erickson Steel Co., 2309 Hamilton, Cleveland, Ohio.  
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.  
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.  
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.  
Homstrand, Inc., Larchmont, N. Y.  
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.  
Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo.  
Lovejoy Tool Co., Inc., Springfield, Vt.  
Maxwell Co., 420 Broadway, Bedford, Ohio.  
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.  
Scully-Jones & Co., 1903 Rockwell St., Chicago, 8, Ill.  
Universal Engineering Co., Frankenmuth 2, Mich.

#### BORING, DRILLING AND MILLING MACHINES, Horizontal

(Floor, Planer or Table Types)

Cincinnati Gilbert Machine Tool Co., 3366 Beekman St., Cincinnati 23, Ohio.  
Cosa Corp., 405 Lexington Ave., New York 17.  
Espin-Lucas Machine Works, Front St. and Girard Ave., Philadelphia, Pa.  
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.  
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.  
Gray, G. A., Co., Woodburn Ave. and Penn. R. R., Evanston, Cincinnati, Ohio.  
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.  
Lucas Mch. Tool Div., New Britain Mch. Co., 12302 Kirby Ave., Cleveland 8, Ohio.  
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.  
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.  
Portage Mch. Co., Sweetzer Ave., Akron 11, O.  
Precision Products Corp., 1328-30 Clark St., Racine, Wis.  
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.  
Turner Bros., Inc., 2625 Hilton Rd., Ferndale 20, Mich.

#### BORING HEADS

Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.  
Beaver Tool & Engineering Corp., 2850 Rochester Rd., Box 429, Royal Oak, Mich.  
Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.

(Continued on page 346)



***the same everywhere...***

***and so is REX HIGH SPEED STEEL***

Rex® High Speed Steels  
Peerless Hot Work Steels  
Malcomb 218  
Chro-Mow®  
Sanderson Carbon Tool Steels  
Ketos®  
AirKool Die Steel  
Airdi® 150  
Nu-Die V Die Casting Steel  
CSM 2 Mold Steel  
La Belle® Silicon #2  
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**SPECIFY  
YOUR TOOL STEELS  
BY  
THESE  
BRAND NAMES**

**CRUCIBLE**

**first name in special purpose steels**

**53 years of** *Fine* **steelmaking**

**TOOL STEELS**

**CRUCIBLE STEEL COMPANY OF AMERICA • TOOL STEEL SALES • SYRACUSE, N. Y.**

For more information on products advertised, use Inquiry Card, page 239

**MACHINERY, September, 1953—345**

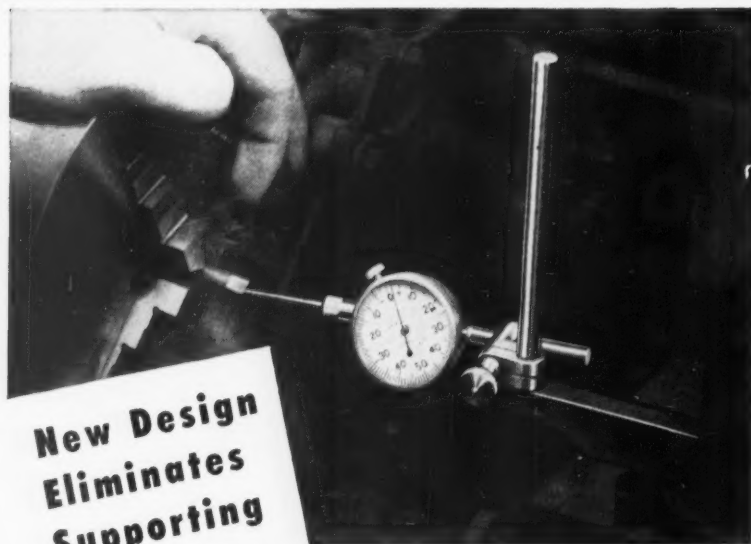
Great pains are taken to ensure that all Crucible REX High Speed Steels are uniform. Every scientific test known is used to make certain that all materials conform exactly to Crucible's high standard of quality. And only *Crucible* makes REX High Speed Steels.

REX High Speed Steels are readily available in all parts of the country... through the widest distribution system maintained for tool and other special purpose steels. For uniformity and dependable delivery, call your nearest Crucible warehouse.

**WRITE TODAY** for the unique Crucible Tool Steel Selector, 9" diameter, in 3 colors — a twist of the dial tells you which tool steel is best for your application. Address your request to Crucible Steel Company of America, Dept. M, Oliver Building, Pittsburgh 22, Pa.







**New Design  
Eliminates  
Supporting  
Arms**



**LUFKIN**

## UNIVERSAL DIAL TEST INDICATOR

### Shortens Working Time

Modern simplified design gives faster readings, guarantees long accurate service. Extra long hole attachment screws directly into base — **requires no supporting arms**. One piece base and shank, jeweled thrust bearing, smooth sensitive mechanism that requires no oiling, adjustable bezel and the easy-to-read dial make the Lufkin Universal Dial Test Indicator lighter, more accurate, more durable. Packed in fitted wood cases complete with all attachments.

**Many New LUFKIN Precision Tools  
make your work easier and better**

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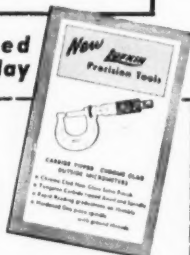
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Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.  
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Maxwell Co., 420 Broadway, Bedford, Ohio.  
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.  
Mummet-Dixon Co., Hanover, Pa.  
Precise Products Corp., 1328-30 Clark St., Racine, Wis.  
Taft-Peirce Mfg. Co., Woonsocket, R. I.  
Universal Engineering Co., Frankenmuth 2, Mich.  
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

### BORING MACHINES

Chandler Tool Co., 514 Ohio Ave., Muncie, Ind.  
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.  
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.  
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.  
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.

### BORING MACHINES, Jig

American Sip Corp., 100 E. 42nd St., New York 17, N. Y.  
Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.  
Cleereman Mch. Tool Co., Green Bay, Wis.  
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.  
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.  
Kearney & Trecker Corp., Milwaukee, Wis.  
Moore Special Tool Co., Inc., 724 Union Ave., Bridgeport, Conn.  
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.  
Pratt & Whitney, West Hartford 1, Conn.  
Triplex Machine Tool Corp., 75 West St., New York 6, N. Y.

### BORING TOOLS

Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.  
American Steel Foundries, King Mch. Tool Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.  
Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.  
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.  
Atrax Co., Newington, Conn.  
Beaver Tool & Engineering Corp., 2850 Rochester Rd., Box 429, Royal Oak, Mich.  
Bullard Co., Brewster St., Bridgeport 2, Conn.  
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.  
Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.  
Eclipse Counterbore Co., 1600 Bonner Ave., Ferndale, Mich.  
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.  
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.  
Gairing Tool Co., 21225 Hoover Rd., Detroit, Mich.  
Giddings & Lewis Mch. Tool Co., Fond du Lac, Wis.  
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.  
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.  
Kennametal, Inc., Latrobe, Pa.  
Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo.  
Lovejoy Tool Co., Inc., Springfield, Vt.  
Maxwell Co., 420 Broadway, Bedford, Ohio.  
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.  
Metal Carbides Corp., Youngstown, Ohio.  
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.  
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.  
Union Twist Drill Co., Athol, Mass.  
Universal Engineering Co., Frankenmuth 2, Mich.  
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

### BRAKES, Press and Bending

Bath, Cyril, Co., 6984 Machinery Ave., Cleveland 3, Ohio.  
Bliss, E. W., Co., 1375 Raff Road, S. W., Canton, Ohio.  
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.  
Cleveland Crane & Engrg. Co., Wickliffe, Ohio.  
Columbia Machinery & Engrg. Corp., Hamilton 1, O.  
Dreis & Krump Mfg. Co., 7416 Loomis Blvd., Chicago 36, Ill.  
Ferracute Machine Co., Bridgeton, N. J.  
Peck, Stow & Wilcox Co., Southington, Conn.  
Verson Alsteel Press Co., 93rd St. and S. Kenwood Ave., Chicago, Ill.  
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

(Continued on page 348)



U.S. Army Photograph

# Quick on the bull's-eye and stay there

## WITH OILGEAR FLUID POWER

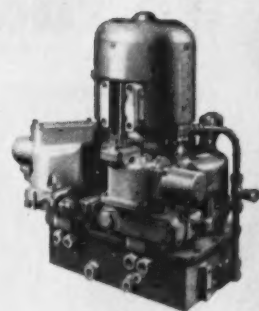
Meeting speed, control and precise performance requirements of today's U. S. Tanks, Howitzers and Anti-Aircraft Guns is a "Natural" for Oilgear ANY-SPEED Fluid Power Components.

Gunners in Sherman, Pershing and Patton tanks experienced the advantages of rapid fluid power slewing and precise fluid power tracking of the turret and gun 360° in either direction. They appreciated the value of Oilgear fluid power that obeyed a light twist of the wrist. Likewise, those manning America's most effective 40 mm anti-aircraft guns, recognized the importance of automatic, self-synchronizing Oilgear fluid power drives for rapid slewing and precise tracking of the carriage 360° in either direction and the rapid, accurate elevating and depressing of the gun for quick homing on the target and following it.

Therefore, when today's new combat vehicles with far greater fire power and accuracy were planned, Oilgear ANY-SPEED Fluid Power Drives were a "Natural" for both turret traverse and gun elevation. They met the demands for accurate control over speed ranges up to 4000:1. They provided unbelievably low tracking speeds under precise response without overrun or drift. They stayed on the target

for repetitive shots. No wonder, one men's magazine calls the new Oilgear equipped M47 "the sharpest shooting tank anywhere today." That's why Oilgear ANY-SPEED fluid power drives are a "Natural" on the wide variety of U. S. combat vehicles.

Don't you think it is time for you to look with wide open eyes at Oilgear Fluid Power Pumps, Motors and Transmissions for your machines . . . to better the performance of an already good machine? To solve a seemingly "impossible" design problem? To synchronize machine units easily and economically? To weed out trouble and cut maintenance and down time to a surprisingly low level? Counsel with an Oilgear Engineering Representative will cost you nothing, may benefit you greatly. THE OILGEAR COMPANY, 1569 W. Pierce St., Milwaukee 4, Wisconsin.



**OILGEAR POWER PACK**

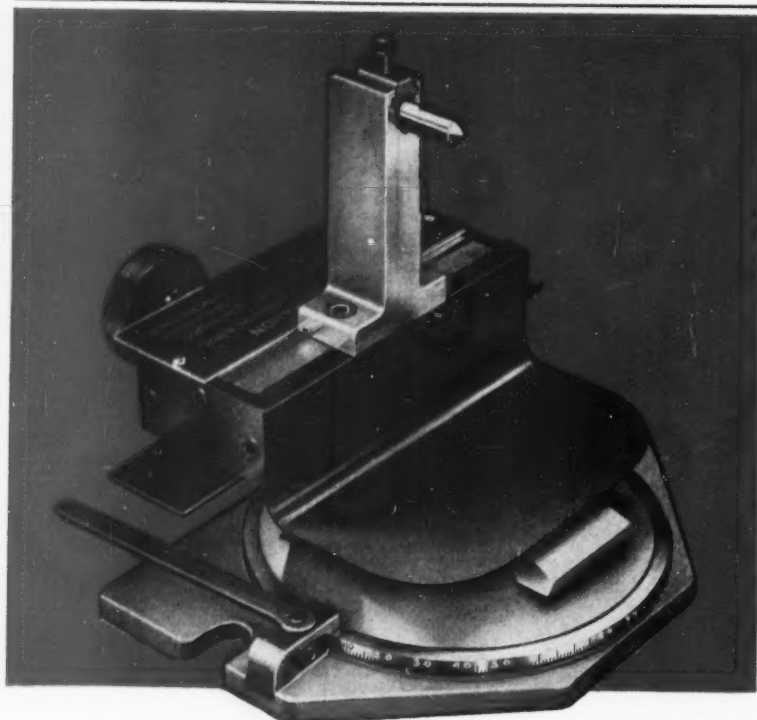
Self-contained unit used in present day tanks and howitzers. Consists of electric drive motor, two Oilgear two-way variable delivery pumps (or generators), oil reservoir and integral closed system controls for turret traverse and gun elevation. Supplies fluid power to Oilgear hydraulic drive motors.



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Colonial Broach Co., P. O. Box 37, Harper Sta., Detroit, Mich.  
Detroit Broach Co., 20201 Sherwood Ave., Detroit, Mich.  
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.  
Illinois Tool Works, 2501 North Keeler Ave., Chicago, Ill.  
Lapointe Mch. Tl. Co., Tower St., Hudson, Mass.  
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.  
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.  
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

### BROACHING MACHINES

American Broach & Mch. Co., Ann Arbor, Mich.  
Cincinnati Milling Mch. Co., Cincinnati, Ohio.  
Colonial Broach Co., P. O. Box 37, Harper Sta., Detroit, Mich.  
Consolidated Mch. Tool Corp., Rochester, N. Y.  
Foot-Burr Co., 1300 St. Clair Ave., Cleveland 8, Ohio.  
Lapointe Mch. Tl. Co., Tower St., Hudson, Mass.  
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.  
Osgear Co., 1560 W. Pierce St., Milwaukee 4, Wis.  
Wilson, K. R., 215 Main St., Buffalo, N. Y.  
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

### BRONZE

American Brass Co., Waterbury 20, Conn.  
Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.  
Chase Brass & Copper Co., Inc., 1949 Rodney St., Waterbury 20, Conn.  
Johnson Bronze Co., New Castle, Pa.

### BRUSHES, Industrial, Wire Wheel, Etc.

Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland, Ohio.

### BUFFERS

Black & Decker Mfg. Co., E. Penna. Ave., Towson, Md. (Portable Elec.).  
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.  
Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.  
Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich.  
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.  
Thor Power Tool Co., Aurora, Ill.  
United States Electrical Tool Div., Emerson Elec. Mfg. Co., 1050 Findlay St., Cincinnati 14, Ohio.

### BULLDOZERS

Ajax Mfg. Co., Euclid, Cleveland 17, Ohio.  
American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.  
Atrax Co., Newington, Conn.  
Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.  
Chambersburg Engrg. Co., Chambersburg, Pa.  
Hufford Machine Works, Inc., 1700 E. Grand Ave., El Segundo, Calif.  
Lake Erie Engineering Corp., Kenmore Station, Buffalo, N. Y.  
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

### BURS

See Files and Burs, Rotary

### BUSHINGS, Brass, Bronze, Carbide, Etc.

Adams Carbide Corp., 999 South 4th St., Harrison, N. J.  
Boston Gear Works, 3200 Main St., North Quincy, Mass.  
Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.  
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York  
Johnson Bronze Co., New Castle, Pa.  
Kennametal, Inc., Latrobe, Pa.

### BUSHINGS, Hardened

Danly Machine Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.  
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.  
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.  
U. S. Steel Co., Inc., 436 7th Ave., Pittsburgh, Pa.

(Continued on page 350)



It's good to see your smile of *satisfaction*, Frank!

Mr. Franklin, foreman, (Frank to us), knows his taps and gages. He measures their efficiency by the one standard of "performance-ability"... performance on the job and the cost records. That's why this experienced supervisor specifies —

## Hanson-Whitney.....

The Hanson Process is the original method of *finishing after hardening*. Through this process, Hanson-Whitney has for 34 years produced a quality line of finished precision taps and gages to the complete satisfaction of our customers.

When threaded parts reach inspection, you will realize the value of "Co-ordinated Responsibility" that the Hanson Process contributes to the solution of your threading problems — the economical dependability of having one manufacturer furnish all of the production elements — precision machine tools, cutting tools and gages.

Yes, Mr. Franklin, the dependable, day-in, day-out performance of these Hanson-Whitney products is recorded on your cost sheets. Naturally, the right tap or gage for the specific job is essential. Ask the Hanson-Whitney representative for recommendations.

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Our "Mr. Franklin" is a composite character typical of the thousands of experienced practical machinists throughout the country. You, too, have a Mr. Franklin in your shop... ask him what he thinks about Hanson-Whitney products.

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Threading Processes

Our Complete  
Co-ordinated  
Responsibility

for

The Machine Tools  
The Cutting Tools  
The Measuring Gages

6HW53A



# KELLER Air Tools

**Increase Production per Man-Hour**



ANOTHER EXAMPLE OF  
**KELLER Air Tools** engineered to industry

Keller Screw Drivers and Nut Setters brought important benefits to a manufacturer of duplicating machines. He says: "Since we started using Keller air tools there has been a noticeable reduction in worker fatigue, and increased production per man-hour."

"Our work requires highly skilled, intelligent workers, and these tools have given them better satisfaction in their jobs, and improved our labor relations."

## FACTS IN BRIEF

ABOUT KELLER PNEUMATIC SCREW DRIVERS

Weight  
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Consume  
less air

Reduce  
operator  
fatigue

Wide variety of  
handles, gear-  
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speeds

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U. S. Tool Co., Inc., 255 N. 18th St., Amper, N. J.

### BUSHINGS, Jig

Colonial Bushings, Inc., 31780 Groesbeck Hwy., Fraser, Mich.  
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.  
Universal Engrg. Co., Frankenmuth, Mich.

### CABINETS, Tool

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.

### CALIPERS

Ames, B. C., & Co. (Dial), Waltham 54, Mass.  
Brown & Sharpe Mfg. Co., Providence, R. I.  
Homstrand, Inc., Larchmont, N. Y.  
Lufkin Rule Co., Hess Ave., Saginaw, Mich.  
Millers Falls Co., Greenfield, Mass.  
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.  
Starrett, The L. S. Co., Athol, Mass.  
Taft-Peirce Mfg. Co., Woonsocket, R. I.

### CAM CUTTING MACHINES

Cosa Corp., 405 Lexington Ave., New York 17, N. Y.  
Fellows Gear Shaper Co., Springfield, Vt.  
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.  
New England Mch. & Tl. Co., Berlin, Conn.  
Pratt & Whitney, West Hartford 1, Conn.  
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.

### CAM MILLING AND GRINDING MACHINES

Landis Tool Co., Waynesboro, Pa.  
New England Mch. & Tl. Co., Berlin, Conn.  
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.  
Precise Products Corp., 1328-30 Clark St., Racine, Wis.  
Rowbottom Machine Co., Waterbury, Conn.

### CAMS

Eisler Engrg. Co., Inc., 760 S. 13th, Newark 3, N. J.  
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.  
Kux Mch. Co., 3930-44 W. Harrison St., Chicago, Ill.  
Rowbottom Machine Co., Waterbury, Conn.

### CARBIDES, TANTALUM, TITANIUM AND TUNGSTEN

Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.  
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.  
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.  
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.  
Kennametal, Inc., Latrobe, Pa.  
Metal Carbides Corp., Youngstown, Ohio.  
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.  
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.  
Wesson Metal Corp., Lexington, Ky.  
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

### CASEHARDENING FURNACES

See Furnaces, Heat-Treating

### CASTINGS, Aluminum, Brass, Bronze, Magnesium, Etc.

Aluminum Co. of America, Oliver Bldg., Pittsburgh, Pa.  
Bethlehem Steel Co. (Brass and Bronze only), Bethlehem, Pa.  
Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.

### CASTINGS, Die

Aluminum Co. of America, Oliver Bldg., Pittsburgh, Pa.  
American Brass Co., Waterbury 20, Conn.  
Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa.  
Madison-Kipp Corp., Madison, Wis.

### CASTINGS, Iron

Bethlehem Steel Co., Bethlehem, Pa.  
Brown & Sharpe Mfg. Co., Providence, R. I.  
Chambersburg Engineering Co., Chambersburg, Pa.  
Hansell-Elcock Co., 485 W. 23rd Place, Chicago 16, Ill.  
Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa.  
Link-Belt Co., 180 W. Duncannon Ave., Philadelphia 20, Pa.

(Continued on page 352)

## *Why* you can reduce rejection losses with a Kodak Conju-Gage Gear Checker

### *Why* the composite check

In practice, the final test of gear quality is how the gear works in use. The composite check recommended in American Standard B6.11-1951 shows this conclusively by measuring displacement of the gear when run against a master of known accuracy. And it does it in one quick operation that checks combinations of as many as six types of errors.

### *Why* the Conju-Gage Gear Checker

Since displacement represents the sum of both gear error and error in the master, the accuracy of the master used determines the precision of the composite check. The Kodak Conju-Gage Gear Checker uses a master of exceptional accuracy, the Conju-Gage Worm Section. Produced by thread grinding, its accuracy is not limited by the same manufacturing processes which limit accuracy in the gear itself.

To settle for masters of lesser accuracy is to rob yourself of "tenths"—to chance that tolerable error in a gear may coincide with error in the master to cause a needless rejection. Or that intolerable error in a gear may be cancelled by error in the master to pass a gear that will fail in use.

To reject every wrong gear is to guard the quality of your product. To pass every right gear is to reduce such rejection losses to a minimum.

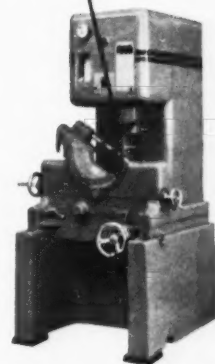
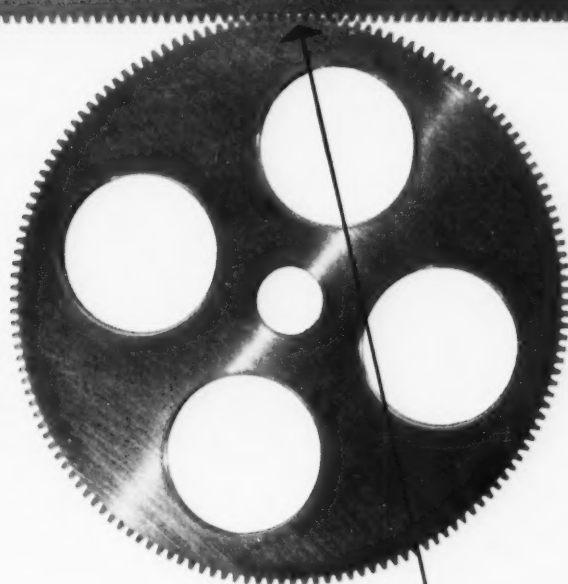
To find out more about how a Kodak Conju-Gage Gear Checker can lower costs while maintaining required precision, send for your copy of the booklet, "Kodak Conju-Gage Gear Testing Principle." Write to

Special Products Sales Division  
EASTMAN KODAK COMPANY, Rochester 4, N.Y.

## CONJU-GAGE INSTRUMENTATION

... a new way to check gear precision in action

*To inspect all kinds of complex parts on a bright screen, Kodak also makes two highly versatile contour projectors.*



The Kodak Conju-Gage Gear Checker automatically records the composite effects of runout, base pitch error, tooth thickness variations, profile error, lead error, and lateral runout. Illustrated is the Kodak Conju-Gage Gear Checker, Model 8U, for gears up to 8 1/4" pitch diameter. Smaller models are also available.

**Kodak**  
MADE IN U.S.A.

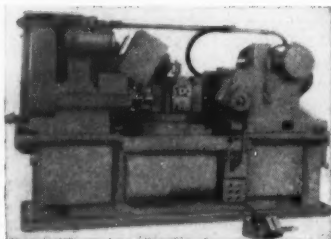
ONLY  
**GOSS and DELEEUW**  
**AUTOMATIC CHUCKERS**  
 offer the 1-2-3 feature



This NEW development—unsurpassed for speed, convenience of tooling and precise finish—involves no retooling problem even for short runs. It assures greater production at lower cost on all classes of work.

The unique "1-2-3" feature, exclusive with Goss & De Leeuw, provides the means for performing one to three right or left hand single or double threading operations simultaneously or in sequence, without changing set up.

Here's an ideal machine tool for small lot requirements because of quick, easy changeover. Any class of chuck work can be handled economically in any quantity.



The examples of work shown here are typical of the wider variety of parts being produced on these new machines.



**SEND FOR**

detailed information on this new machine. Let us have samples of your work in order to give you time and cost estimates for handling it on the "1-2-3" Goss & De Leeuw.



**GOSS and DE LEEUW**  
 MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

#### CASTINGS, Steel, Alloys, Etc.

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.  
 Bethlehem Steel Co., Bethlehem, Pa.  
 Birdsboro Steel Fdry. & Mch. Co., Birdsboro, Pa.  
 Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.  
 Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.  
 Lebanon Steel Foundry, Dept. J, Lebanon, Pa.  
 Link-Belt Co., 180 W. Duncannon Ave., Philadelphia 20, Pa.  
 U. S. Steel Corp., Columbia Steel Co., Div., 436 7th Ave., Pittsburgh, Pa.

#### CEMENT, Disc Grinding Wheel

Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

#### CENTERING MACHINES

Consolidated Mch. Tool Corp., Rochester, N. Y.  
 Espen-Lucas Machine Works, Front St. and Girard Ave., Philadelphia, Pa.  
 Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.  
 Jones & Lamson Mch. Co., Springfield, Vt.  
 Seneca Falls Mch. Co., Seneca Falls, N. Y.  
 Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.  
 Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.  
 Triplex Machine Tool Corp., 75 West St., New York 6, N. Y.

#### CENTERS, Lathe

Adams Carbide Corp., 999 South 4th St., Harrison, N. J.  
 Carboly Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.  
 Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.  
 Eclipse Counterbore Co., 1600 Bonner Ave., Ferndale, Mich.  
 Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.  
 Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.  
 Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.  
 Kennametal, Inc., Latrobe, Pa.  
 Metal Carbides Corp., Youngstown, Ohio.  
 Morse Twist Drill & Mch. Co., New Bedford, Mass.  
 Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.  
 South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.  
 Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.  
 Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.  
 Union Twist Drill Co., Athol, Mass.  
 Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.  
 Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

#### CHAINS, Power Transmission and Conveyor

Boston Gear Works, 3200 Main St., North Quincy, Mass.  
 Link-Belt Co., 220 S. Belmont Ave., Indianapolis 6, Ind.  
 Ohio Gear Co., 1333 E. 179th St., Cleveland, Ohio.  
 Philadelphia Gear Works, Erie Ave. and G St., Philadelphia, Pa.

#### CHISELS AND CHISEL BLANKS

Bethlehem Steel Co., Bethlehem, Pa.  
 Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.  
 Cleco Div., Reed Roller Bit Co., 5125 Clinton Ave., Houston 20, Texas.  
 Thor Power Tool Co., Aurora, Ill.

#### CHUCKING MACHINES

Bardons & Oliver, Inc., Ft. W. 9th St., Cleveland 13, Ohio.  
 Bullard Co., Brewster St., Bridgeport 2, Conn.  
 Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.  
 Goss & DeLeeuw Mch. Co. (Multiple Spindle), Kensington, Conn.  
 Heald Machine Co., 10 New Bond St., Worcester 6, Mass.  
 Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.  
 National Acme Co. (Multiple Spindle), 170 E. 131st St., Cleveland, Ohio.  
 Potter & Johnston Co., 1027 Newport Ave., Pawtucket, R. I.  
 Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.  
 Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

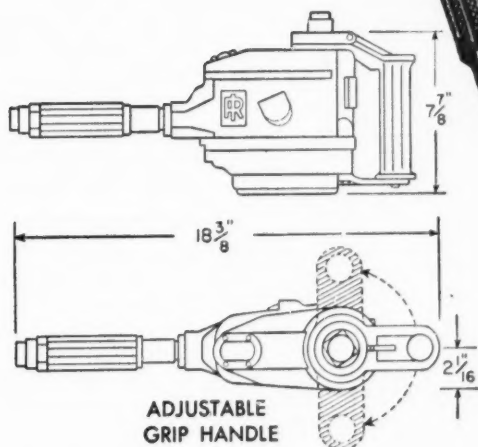
(Continued on page 354)

# stop

*doing these jobs by hand!*



Size 518 Air Impactool for  $\frac{3}{4}$ " bolt size heavy duty jobs. Weight  $23\frac{1}{2}$  pounds.



• **STOP STRAINING** on those nuts on high pressure pipe flange jobs.

• **STOP SLUGGING** nuts when repairing steel mill blast furnace gate valves.

• **STOP SWEATING** over those nuts when replacing trays in refinery bubble towers.

• **STOP STRUGGLING** to remove connecting rod bearing cap nuts and oil pan nuts on Diesel locomotives.

**NEW IMPACTOOL** makes tough jobs easy!

The *only* power tool that can be used to do these tough jobs is the new Size 518 Air Impactool. Savings, through greatly reduced downtime, often pay for it on one single maintenance job! The 518 Impactool fits into the tightest places, quickly applies or removes the toughest nuts, with no kick or twist to the operator.

This new Air Impactool is one more addition to a famous line—the world's most complete, versatile, and dependable group of Impactools. Fourteen sizes of Air Impactools for nut running capacities from  $\frac{7}{32}$ " to 4" bolt size.

## Ingersoll-Rand

11 Broadway, New York 4, N. Y.

921-B

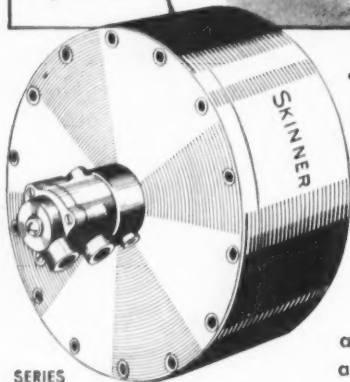
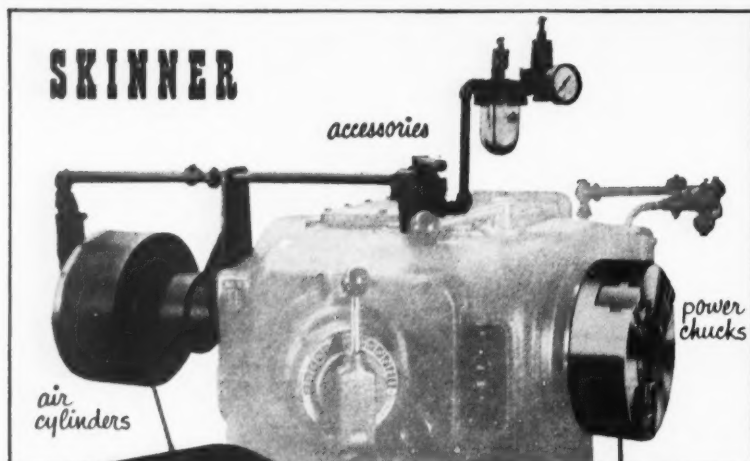
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AIR AND ELECTRIC

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MACHINERY, September, 1953—353





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...for every  
high production need!

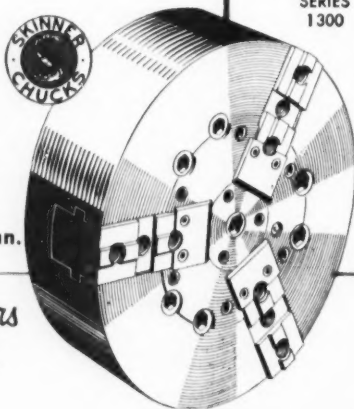
The Skinner line of power chucking equipment has the strength, rigidity and design features so essential for today's production needs. Chucks are available from 6" to 21" with forged steel bodies, and with either 2 or 3 adjustable or non-adjustable jaws. Exclusive sliding wedge construction grips internal or external work positively regardless of jaw position. The chuck will not release the work, even if air line is broken, until operator actuates the draw bar. Skinner double-acting rotating (series 2100 for speeds up to 1500 R. P. M.) and non-rotating air cylinders are available with semi-steel bodies for all sizes of Skinner power chucks, and for actuating all types of holding fixtures and tailstocks. Series 2200 double-acting rotating air cylinders have aluminum bodies for efficient operation up to 3000 spindle R. P. M. Skinner accessories include hand-operating valves—complete air unit, including regulating valve, pressure gage and lubricator—filters—soft blank top jaws; draw bars—draw tubes, etc.

*Write* for catalog giving complete details on the Skinner line of power and manually operated chucks. And ask about new movie "Chucks and Their Uses"—available for free showings.

THE **SKINNER**  
**CHUCK COMPANY**

206 Edgewood Ave., New Britain, Conn.

*Sold by leading distributors  
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SERIES  
1300

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Cushman Chuck Co., Windsor Ave., Hartford 2, Conn.  
Durable Products, 816 W. 50th St., Minneapolis 19, Minn.  
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.  
Huffard Machine Works, Inc., 1700 E. Grand Ave., El Segundo, Calif.  
Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.  
Mead Specialties Co., 4114 North Knox Ave., Chicago 41, Ill.  
Schrader's Son, A., 470 Vanderbilt Avenue, Brooklyn, N. Y.  
Skinner Chuck Co., 344 Church St., New Britain, Conn.  
Tomkins-Johnson Co., Jackson, Mich.  
Whiton Machine Co., 190 Howard St., New London, Conn.  
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

#### CHUCKS, Collet or Split

See Collets

#### CHUCKS, Diaphragm

Van Norman Co., 2640 Main St., Springfield 7, Mass.  
Woodworth, N. A., Co., 1300 E. Nine Mile Rd., Detroit 20, Mich.

#### CHUCKS, Drill

Erickson Tools, Div. Erickson Steel Co., 2309 Hamilton, Cleveland, Ohio.  
Etico Tool Co., Inc., 592 Johnson Ave., Brooklyn, N. Y.  
Jacobs Mfg. Co., West Hartford, Conn.  
McCroskey Tool Corp., 1938 Thomas St., Meadville, Pa.  
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.  
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.  
Skinner Chuck Co., 344 Church St., New Britain, Conn.  
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.  
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

#### CHUCKS, Full Floating

Erickson Tools, Div. Erickson Steel Co., 2309 Hamilton, Cleveland, Ohio.  
Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, Staten Island, N. Y.  
Gisholt Mch. Co., Madison 10, Wis.  
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.  
Universal Engineering Co., Frankenmuth 2, Mich.

#### CHUCKS, Gear

Horton, E. & Son Co., Windsor Locks, Conn.  
Woodworth, N. A., Co., 1300 E. Nine Mile Rd., Detroit 20, Mich.

#### CHUCKS, Lathes, Etc.

Buck Tool Co., 220 Schippers La., Kalamazoo, Mich.  
Bullard Co., Brewster St., Bridgeport 2, Conn.  
Cushman Chuck Co., Windsor Ave., Hartford 2, Conn.  
Erickson Tools, Div. Erickson Steel Co., 2309 Hamilton, Cleveland, Ohio.  
Gisholt Mch. Co., Madison 10, Wis.  
Jacobs Mfg. Co., West Hartford, Conn.  
Jones & Lamson Mch. Co., Springfield, Vt.  
Horton, E. & Son Co., Windsor Locks, Conn.  
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.  
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.  
Skinner Chuck Co., 344 Church St., New Britain, Conn.  
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.  
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.  
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.  
Whiton Machine Co., 190 Howard St., New London, Conn.  
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

#### CHUCKS, Magnetic

Brown & Sharpe Mfg. Co., Providence, R. I.  
DoAll Co., 234 Laurel Ave., Des Plaines, Ill.  
Hanchett Magna-Lock Corp., Big Rapids, Mich.  
Taff-Peirce Mfg. Co., Woonsocket, R. I.  
Walker, O. S., Co., Inc., Worcester, Mass.

#### CHUCKS, Power Operated

Skinner Chuck Co., 344 Church St., New Britain, Conn.

(Continued on page 356)



# TOOL LIFE BOOSTED 60 to 80% WITH SHEAR-SPEED SOLUBLE OIL!

**machine down-time cut in the production of gears for a large auto manufacturer.**

Convince yourself of the amazing advantages and versatility of SHEAR-SPEED Soluble Oil in your own plant. Sold only on a satisfaction guaranteed test basis. Write for Bulletin SO-53 and price list.

IMPARTIAL TESTS of two highly-rated cutting fluids vs. SHEAR-SPEED Soluble Oil were run under exactly similar production conditions: same machine, same parts, same cutting speed, same coolant flow, same tool grinding

|                                  | Cutting Fluid X | Cutting Fluid Y | SHEAR-SPEED Soluble Oil | S/S Soluble Oil Gave This: |
|----------------------------------|-----------------|-----------------|-------------------------|----------------------------|
| Average No. gears cut per grind  | 177.6           | 193             | 228                     | More pieces per grind      |
| Tool stock removed per grind     | .0227"          | .0288"          | .0188"                  | Less tool wear             |
| No. of grinds per .375" hob wear | 16              | 13              | 20                      | Longer tool life           |
| Average tool life                | 2842 parts      | 2509 parts      | 4560 parts              | Lower tool cost per piece  |

**SHEAR SPEED**  
CHEMICAL PRODUCTS

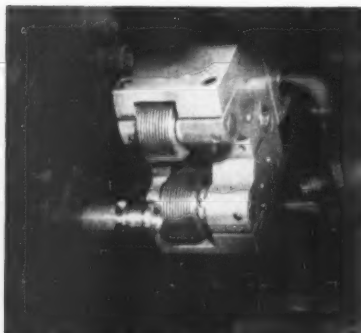
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For more than  
100 Sizes of  
Automatics

Operating from the cross slides of automatic screw machines, each size is adjustable to accommodate an infinite range of work diameters within its capacity. Maximum thread rolling capacity within the tooling sector of over 100 sizes of single and multiple spindle automatic screw machines is possible through the selection of one of the four standard attachments.



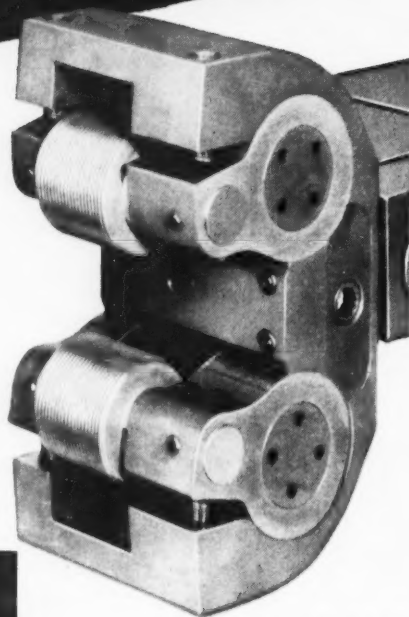
Reed attachments have two opposed rolls which pass over the work when rolling the thread. They are easy to set up and rolls may be quickly changed and adjusted for size. A simple device provides precise matching of the rolls.

Send us specifications of your requirements and let us supply you with complete information.

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THREAD ROLLING MACHINES and DIES • KNURLS • THREAD ROLLS  
Worcester, Massachusetts, U. S. A.

Sales Offices in: Buffalo, Chicago, Cleveland, Compton, Calif., Detroit, Englewood, N. J., Houston, Indianapolis, Milwaukee, Montreal, New York City, Philadelphia, Pittsburgh, St. Louis, Syracuse, Toronto



SERIES G2A

The attachment consists of two units, a head and an adapter. The heads are of compact rigid design and are assembled to an adapter by a floating swivel connection. Adapters are of the solid or adjustable type, and are designed for various cross slide positions on the automatics. A large assortment of adapters are available that permit more than 300 cross slide applications.

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Clarkson, Inc., 320 Ontario St., Toledo, O.  
Erickson Tools, Div. Erickson Steel Co., 2309 Hamilton, Cleveland, Ohio.  
Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, S. I., N. Y.  
Jarvis, Charles L., Co., Middletown, Conn.  
McCroskey Tool Corp., 1938 Thomas St., Meadville, Pa.  
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.  
Proconier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.  
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.  
Universal Engineering Co., Frankenmuth 2, Mich.

#### CHUCKS, Ring Wheel

Gardner Mch. Co., Div. Landis Tool Co., 414 E. Gardner St., Beloit, Wis.

#### CHUCKS, Tapping

Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, S. I., N. Y.

Homstrand, Inc., Larchmont, N. Y.  
Jacobs Mfg. Co., West Hartford, Conn.  
McCroskey Tool Corp., 1938 Thomas St., Meadville, Pa.  
Proconier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.  
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.  
Skinner Chuck Co., 344 Church St., New Britain, Conn.

#### CIRCUIT-BREAKERS

General Electric Co., Schenectady 5, N. Y.  
Westinghouse Electric Corp., Pittsburgh 30, Pa.

#### CLAMPING APPLIANCES FOR MACHINE TOOLS

Standard Shop Equipment Co., Inc., 8299 W. Tinicum Ave., Philadelphia, Pa.  
Swartz Tool Products Co., Inc., 13330 Foley Ave., Detroit, Mich.

#### CLAMPS

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.  
Brown & Sharpe Mfg. Co., Providence, R. I.  
Danly Mch. Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.  
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.  
Lufkin Rule Co., Hess Ave., Saginaw, Mich.  
Mead Specialties Co., 4114 N. Knox Ave., Chicago 41, Ill.  
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.  
Standard Shop Equipment Co., Inc., 8299 W. Tinicum Ave., Philadelphia, Pa.  
Starrett, The L. S. Co., Athol, Mass.  
Swartz Tool Products Co., Inc., 13330 Foley Ave., Detroit, Mich.

#### CLEANERS, Chemical, for Metal

Bullard Co., Bullard-Dunn Process Div., Brewster St., Bridgeport 2, Conn.  
Oakite Products, Inc., 19 Rector St., New York, N. Y.

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Clearing Mch. Corp., 6499 W. 65th St., Chicago 38, Ill.  
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.  
Formsprag Co., 23609 Hoover Rd., Van Dyke, Mich.  
Link-Belt Co., 300 West Pershing Rd., Chicago 9, Ill.  
Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.  
Rockford Clutch Div., Borg-Warner Corp., 410 Catherine St., Rockford, Ill.  
Twin Disc Clutch Co., 1361 Racine St., Racine, Wis.

#### COLLARS, Safety

Link-Belt Co., 220 S. Belmont Ave., Indianapolis 6, Ind.  
Standard Pressed Steel Co., Jenkintown, Pa.

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Brown & Sharpe Mfg. Co., Providence, R. I.  
Erickson Tools, Div. Erickson Steel Co., 2309 Hamilton, Cleveland, Ohio.  
Gisholt Mch. Co., 1245 E. Washington Ave., Madison 10, Wis.  
Hardinge Bros., Inc., 1418 College Ave., Elmira, N. Y.  
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.

(Continued on page 358)



# "Specific" TAPS

## CUT YOUR TAPPING COSTS

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|----|---|------|--|
| 1. | If you use taps in just one kind of material  | .... | Then order 'DETROIT' Specific taps for that material.  |
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For more information on products advertised, use Inquiry Card, page 239

MACHINERY, September, 1953—357





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South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.  
Tomkins-Johnson Co., Jackson, Mich.  
Union Twist Drill Co., Athol, Mass.  
Universal Engrg. Co., Frankenmuth 2, Mich.  
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

#### COMPARATORS

See Gages, Comparator.

#### COMPARATORS, Optical

DaSil Co., 254 Laurel Ave., Des Plaines, Ill.  
Eastman Kodak Co., Rochester, N. Y.  
Jones & Lamson Mch. Co., Springfield, Vt.  
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

#### COMPOUNDS, Cleaning

Houghton, E. F. & Co., 303 W. Lehigh Ave., Philadelphia, Pa.  
Oakite Products, Inc., 19 Rector St., New York,

#### COMPOUNDS, Cutting, Grinding, Metal Drawing, Etc.

Air Conversion Research Corp., 4107 N. Damen Ave., Chicago 18, Ill.  
Cities Service Oil Co., 70 Pine St., New York, N. Y.  
Gulf Oil Corp., Gulf Bldg., Pittsburgh 30, Pa.  
Houghton, E. F. & Co., 303 W. Lehigh Ave., Philadelphia, Pa.  
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich. (Broaching & Lapping).  
Oakite Products, Inc., 19 Rector St., New York, N. Y.  
Sinclair Refining Co., 630 5th Ave., New York.  
Standard Oil Co. (Indiana), 910 S. Michigan, Chicago, Ill.  
Stuart, D. A., Oil Co., Ltd., 2739 S. Troy St., Chicago 23, Ill.  
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.  
Texas Co., 135 E. 42nd St., New York, N. Y.  
Tide Water Associated Oil Co., 17 Battery Place, New York, N. Y.

#### COMPOUNDS, Resin and Molding

Bakelite Co., Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.  
General Electric Co., Schenectady 5, N. Y.

#### COMPRESSORS, Air

Air Conversion Research Corp., 4107 N. Damen Ave., Chicago 18, Ill.  
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.  
Ingersoll-Rand Co., Phillipsburg, N. J.

#### CONTOUR FOLLOWER

Turchan Follower Machine Co., 8259 Livernois and Alaska Aves., Detroit, Mich.

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Columbus Die-Tool & Mch. Co., 955 Cleveland Ave., Columbus, Ohio.  
Diefendorf Gear Corp., 920 N. Belden Ave., Syracuse, N. Y.  
Eisler Engrg. Co., Inc., 760 S. 13th, Newark 3, N. J.  
Fellows Gear Shaper Co., Springfield, Vt.  
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.  
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.  
Hill Acme Co., 1201 W. 65th St., Cleveland, Ohio.  
Minster Machine Co., Minster, Ohio.  
Morse Twist Drill & Mch. Co., New Bedford, Mass.  
Mummet-Dixon Co., Hanover, Pa.  
National Acme Co., 170 E. 131st St., Cleveland, Ohio.  
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.  
Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.  
Sheffield Corp., 721 Springfield, Dayton, Ohio.  
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.  
Wicaco Machine Corp., Stenton Ave. and Loudon St., Philadelphia, Pa.

#### CONTROLLERS

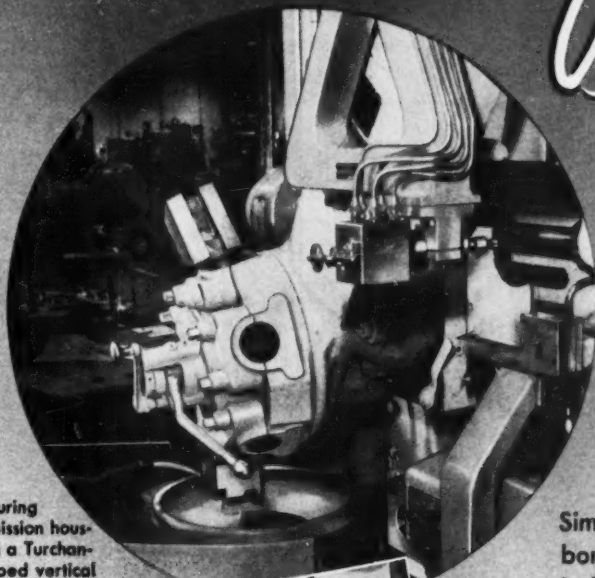
Allen-Bradley Co., 1326 S. 2nd St., Milwaukee, Wis.  
General Electric Co., Schenectady 5, N. Y.  
Westinghouse Electric Corp., Pittsburgh 30, Pa.

#### CONTROLS, THERMO

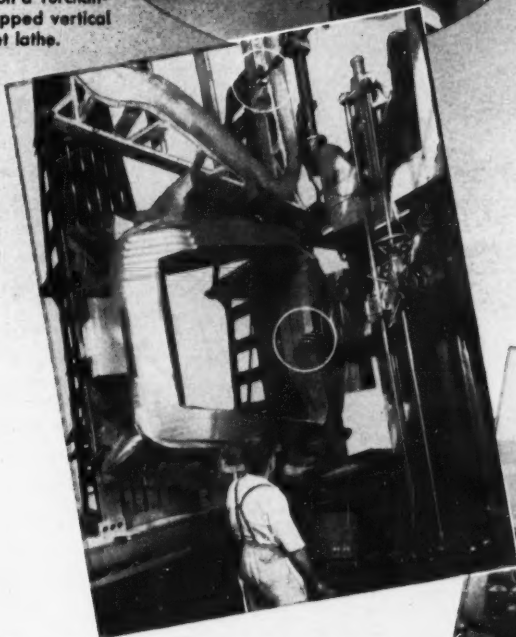
Control Products, Inc., 306 Sussex St., Harrison, N. J.

(Continued on page 360)

# *Turchan* has what industry needs in the trend to *Automation*

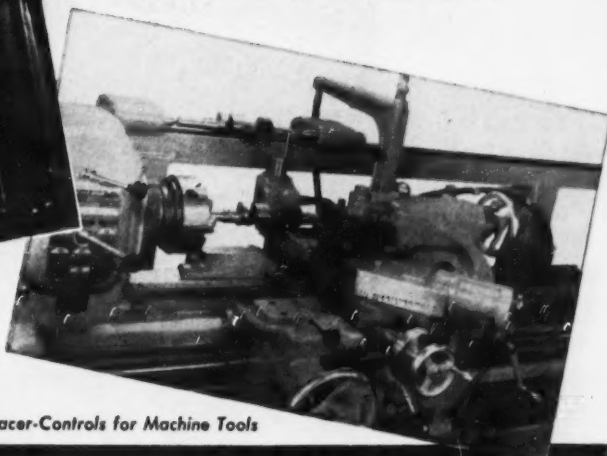


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Profiling and countouring large auto body die by Turchan tracer controlled boring mill.

Intricate auto crankshaft being turned by Turchan 45° compound lathe attachment.



**tracer-controls help meet demands for**

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Simplify difficult contouring, profiling and boring jobs — make straight work a "snap." Include Turchan equipment in your present and future plans for automation of standard or special machines, assuring finest precision tracer-controlled operation. Any size or make machine tool can be Turchan-equipped.

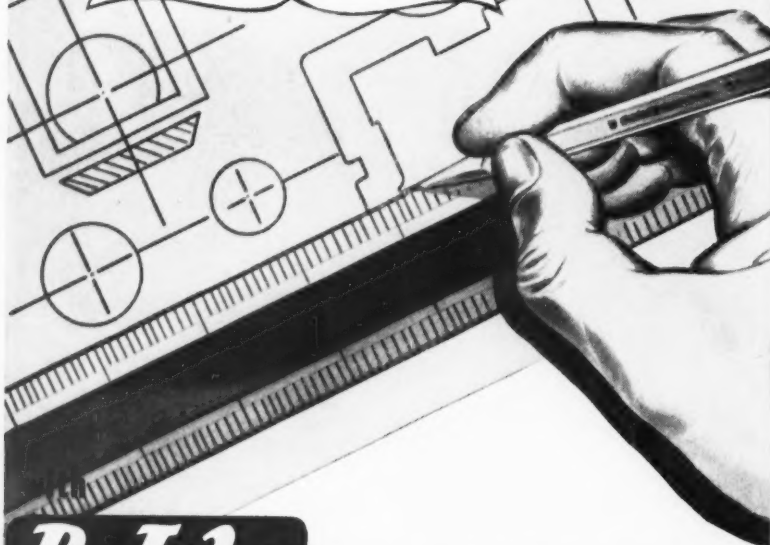
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Oldest Manufacturer of Tracer-Controls for Machine Tools

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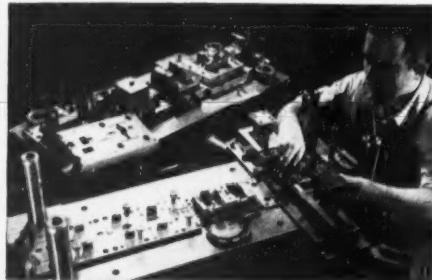
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Besly-Welles Corp., Beloit, Wis.  
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.  
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.  
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.  
Eclipse Counterbore Co., 1600 Bonner Ave., Ferndale, Mich.  
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.  
Firth Sterling, Inc., 3113 Forbes St., Pittsburgh 30, Pa.  
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.  
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.  
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.  
Kennametal, Inc., Latrobe, Pa.  
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.  
National Twist Drill & Tool Co., Rochester, Mich.  
Pratt & Whitney, West Hartford 1, Conn.  
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.  
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.  
Starrett, The L. S. Co., Athol, Mass.  
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.  
Union Twist Drill Co., Athol, Mass.  
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.  
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

### COUNTERSHAFTS

Standard Pressed Steel Co., Jenkintown, Pa.

### COUNTERSINKS

Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.  
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.  
Eclipse Counterbore Co., 1600 Bonner Ave., Ferndale, Mich.  
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.  
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.  
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.  
Greenfield Tap & Die Corp., Greenfield, Mass.  
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.  
Morse Twist Drill & Mch. Co., New Bedford, Mass.  
National Twist Drill & Tool Co., Rochester, Mich.  
Peck, Stow & Wilcox Co., Southington, Conn.  
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.  
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.  
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.  
Union Twist Drill Co., Athol, Mass.

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Brown & Sharpe Mfg. Co., Providence, R. I.  
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Starrett, The L. S. Co., Athol, Mass.  
Veeder-Root, Inc., 20 Sargent St., Hartford, Conn.

### COUNTING DEVICES

Starrett, The L. S. Co., Athol, Mass.  
Veeder-Root, Inc., 20 Sargent St., Hartford, Conn.

### COUPLINGS, Flexible

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Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.  
James D. O., Gear Mfg. Co., 1140 W. Monroe St., Chicago 7, Ill.  
Link-Belt Co., 220 S. Belmont Ave., Indianapolis 6, Ind.

(Continued on page 362)



output for \$330

INLET

PATENT PENDING

*Mead Drill Press Feed mounted on spindle quill of drill press*

*Mead Drill  
Press Feed  
mounted on  
spindle quill  
of drill press*

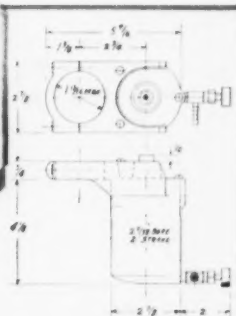
**PATENT PENDING**

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for DRILLING, TAPPING, REAMING**

This simple, inexpensive device quickly converts standard drill presses into semi-automatic machines: doubles production on suitable jobs in many cases. Clamps to spindle quill in a few seconds. Automatically closes air fixture on work. Adjustable feed control and break-through cushion. Quick return. Easy to synchronize with automatic cycle equipment. Fits any size press up to 2 1/4" spindle diameter. Use genuine Mead Pneumatic Drill Press Feeds for faster, cheaper, more profitable production. Get the facts—send coupon.

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**Specifications:** *Power factor, 4 times line pressure; Stroke, 2½" (approx); Bore, 2"±; Capacity, ½" steel; Weight, 2 lbs. (approx).*

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**New MEAD INDUSTRIAL  
AIR POWER CATALOG**

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**Never Before**  
**SO MANY ADVANTAGES**  
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**3800 PER HOUR!**  
**2500 PER HOUR!**

*For Top  
Production*



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### FULL UNIVERSAL MACHINES

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Crossdrill and C" T" Sink 1/16" Hole  
 Material—Brass  
 Production—4800 per hour  
 Fixture—#15 Vertical Index  
 Equipment—#1-UD Drilling Machine



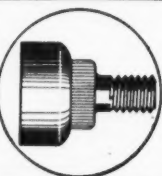
#### TAPPING

Tap Two #10-32 Holes  
 Material—Steel stamping  
 Production—3800 tapped holes per hour  
 Fixture—#14 horizontal index  
 Equipment—#1-UT tapping machine



#### THREADING

3/8"—24 Thread—1/2" Long  
 Material—Die Cast Aluminum  
 Production—2500 per hour  
 Fixture—#10 Drum dial  
 Equipment—#3-TR Threading machine



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 James, D. O., Gear Mfg. Co., 1140 W. Monroe St., Chicago 7, Ill.  
 Link-Belt Co., 2045 W. Huntington Park Ave., Philadelphia 40, Pa.  
 Sier-Bath Gear & Pump Co., Inc., 9248 Hudson Blvd., North Bergen, N. J.  
 Southwestern Tool & Engrg. Co., 117 Hollier, Dayton, Ohio.  
 Standard Pressed Steel Co., Jenkintown, Pa.

#### CRANES, Electric Traveling

Cleveland Crane & Engrg. Co., Wickliffe, Ohio.  
 Morgan Engrg. Co., Alliance, Ohio.

#### CUTTER GRINDERS

See Grinding Machines, for Sharpening Cutters, Reamers, Hobs, Etc.

#### CUTTERS, Gear

Brown & Sharpe Mfg. Co., Providence, R. I.  
 Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 6, Mich.  
 Fellows Gear Shaper Co., 78 River St., Springfield, Vt.  
 Hanson-Whitney Co., Div., Whitney Chain Co., Hartford, Conn.  
 Illinois Tool Works, 2501 North Keeler Ave., Chicago, Ill.  
 Morse Twist Drill & Mch. Co., New Bedford, Mass.  
 National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich. (Shaving).  
 National Tool Co., 11200 Madison Ave., Cleveland, Ohio.  
 National Twist Drill & Tl. Co., Rochester, Mich.  
 Pratt & Whitney, West Hartford 1, Conn.  
 Shear-Speed Chem. Prod. Div. Michigan Tool Co., 7125 E. McNichols Rd., Detroit 12, Mich.  
 Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.  
 Union Twist Drill Co., Athol, Mass.  
 Waltham Mch. Wks., Newton St., Waltham, Mass.  
 Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

#### CUTTERS, Keyseater

Davis Keyseater Co., 405 Exchange St., Rochester 8, N. Y.  
 Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.  
 Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.  
 Keo Cutters, 19326 Woodward, Detroit, Mich.  
 Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

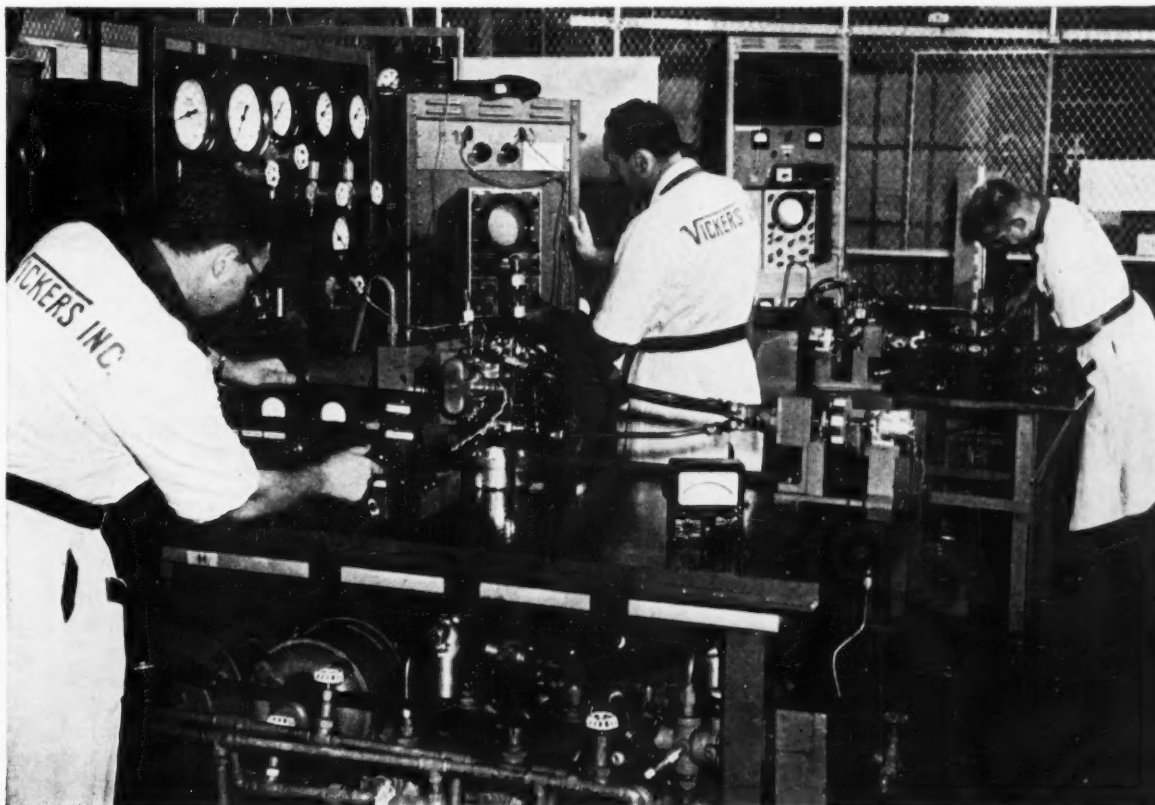
#### CUTTERS, Milling

Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.  
 Atrax Co., Newington, Conn.  
 Barber-Colman Co., Rock St., Rockford, Ill.  
 Beaver Tool & Engineering Corp., 2850 Rochester Rd., Box 429 Royal Oak, Mich.  
 Brown & Sharpe Mfg. Co., Providence, R. I.  
 Carboly Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.  
 Clarkson, Inc., 320 Ontario St., Toledo, O.  
 Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.  
 Douglas Tool Co., 2300 E. Nine Mile Rd., Hazel Park, Mich.  
 Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.  
 Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.  
 Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.  
 Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.  
 Gorton, George, Mch. Co., 1110 W. 13th St., Racine, Wis.  
 Hanson-Whitney Co., Div., Whitney Chain Co., Hartford, Conn.  
 Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.  
 Illinois Tool Works, 2501 North Keeler Ave., Chicago, Ill.  
 Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.  
 Kearney & Trecker Corp., Milwaukee, Wis.  
 Kennametal, Inc., Latrobe, Pa.  
 Lovejoy Tool Co., Inc., Springfield, Vt.  
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(Continued on page 366)

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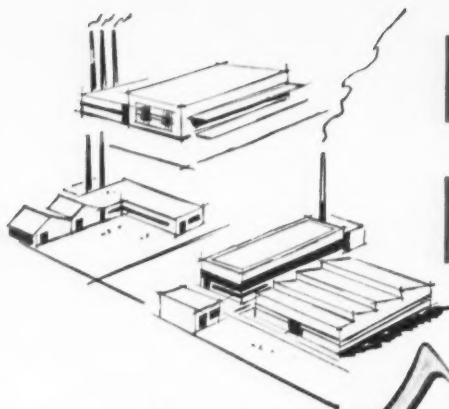
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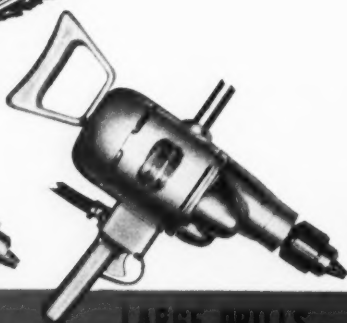
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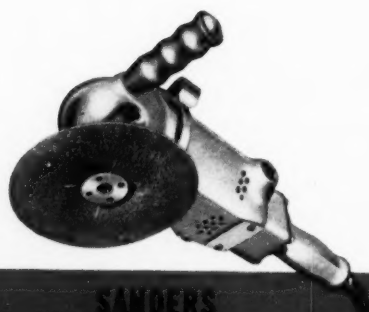
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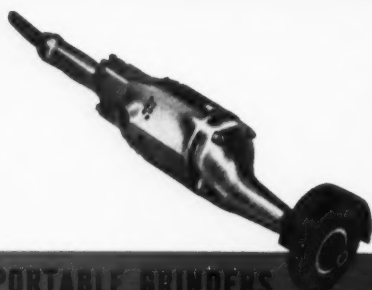
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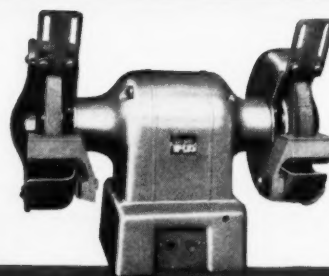
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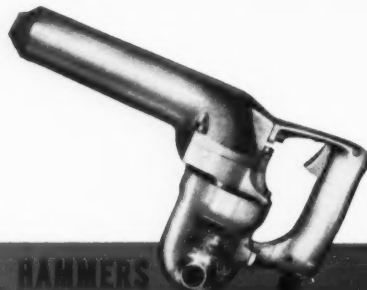
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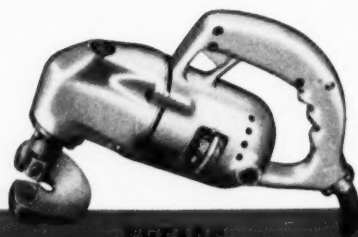
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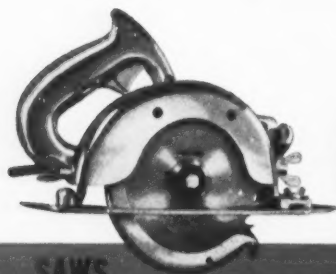
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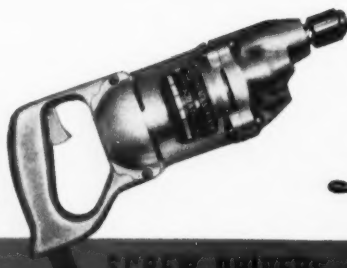
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Pratt & Whitney, West Hartford 1, Conn.  
Scully-Jones & Co., 1903 Rockwell St., Chicago, 8, Ill.  
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Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.  
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Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.  
Willey's Carbide Tool Co., 1340 W. Verner Hwy., Detroit 1, Mich.

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## CUTTING COMPOUNDS

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DoAll Co., 254 Laurel Ave., Des Plaines, Ill.  
Gulf Oil Corp., Gulf Bldg., Pittsburgh 30, Pa.  
Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa.  
Shear-Speed Chemical Products, Div. Michigan Tool Co., 14230 Birwood Ave., Detroit 4, Mich.  
Sinclair Refining Co., 630 4th Ave., New York.  
Standard Oil Co., (Indiana), 910 S. Michigan, Chicago, Ill.  
Stuart, D. A., Oil Co., Ltd., 2739 S. Troy St., Chicago 23, Ill.  
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.  
Texas Co., 135 E. 42nd St., New York, N. Y.  
Tide Water Associated Oil Co., 17 Battery Place, New York, N. Y.

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Brown & Sharpe Mfg. Co., Providence, R. I.  
Cone Automatic Mch. Co., Windsor, Vt. (Lathe Type).  
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Landis Machine Co., Waynesboro, Pa. (Pipe).  
Modern Machine Tool Co., 601 S. Water St., Jackson, Mich. (Lathe Type for Tubing).  
Pines Engineering Co., Inc., Aurora, Ill.

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Columbia Machinery & Engrg. Corp., Hamilton, O.  
Delta Power Tool Div., Rockwell Mfg. Co., 614 G. N. Lexington Ave., Pittsburg 8, Pa.

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See Sawing Machines, Circular.

## CUTTING-OFF MACHINES,

### Metal Band Saws

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DoAll Co., 254 Laurel Ave., Des Plaines, Ill.  
Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.  
Grab Bros., Grafton, Wis.

## CUTTING-OFF TOOLS

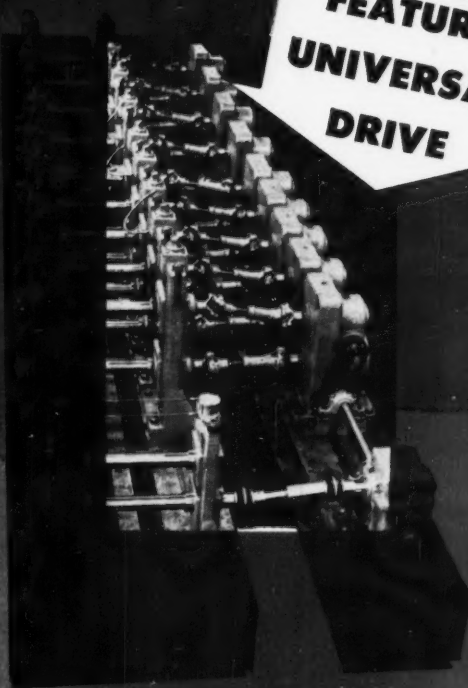
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.  
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.  
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.  
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.  
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.  
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.  
Illinois Tool Works, 2501 North Keeler Ave., Chicago, Ill.  
Kennametal, Inc., Latrobe, Pa.  
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Pratt & Whitney, West Hartford 1, Conn.  
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(Continued on page 368)

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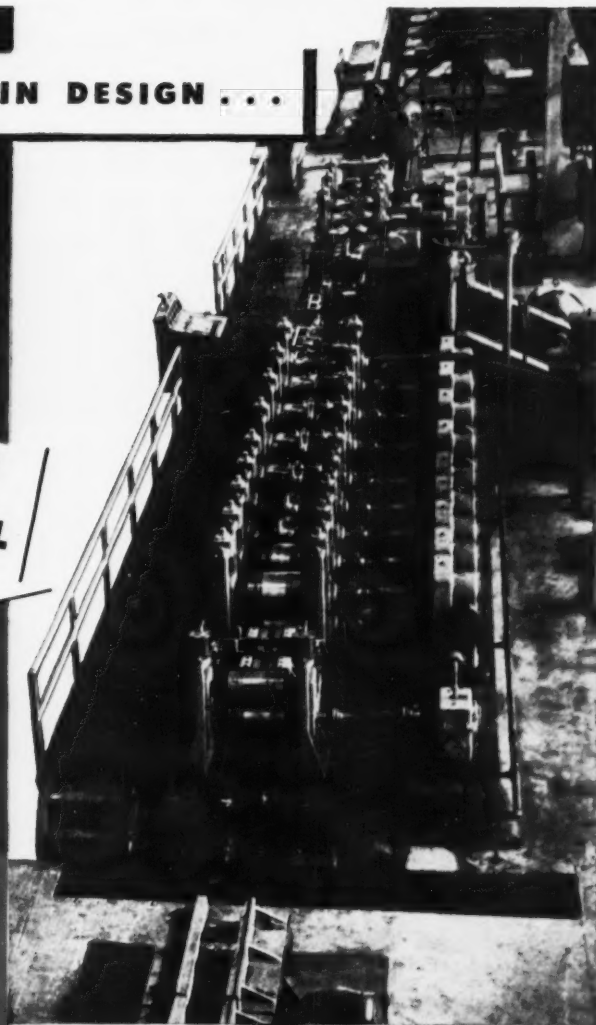
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*Etna Universal Drive*

You'll notice a trend toward Etna's modern machine design. Etna has sold more Universal Drive Mills than all other manufacturers combined. The Universal Drive provides greater accuracy in the forming of the tube, and allows an easier change from the manufacture of one diameter tube to another.

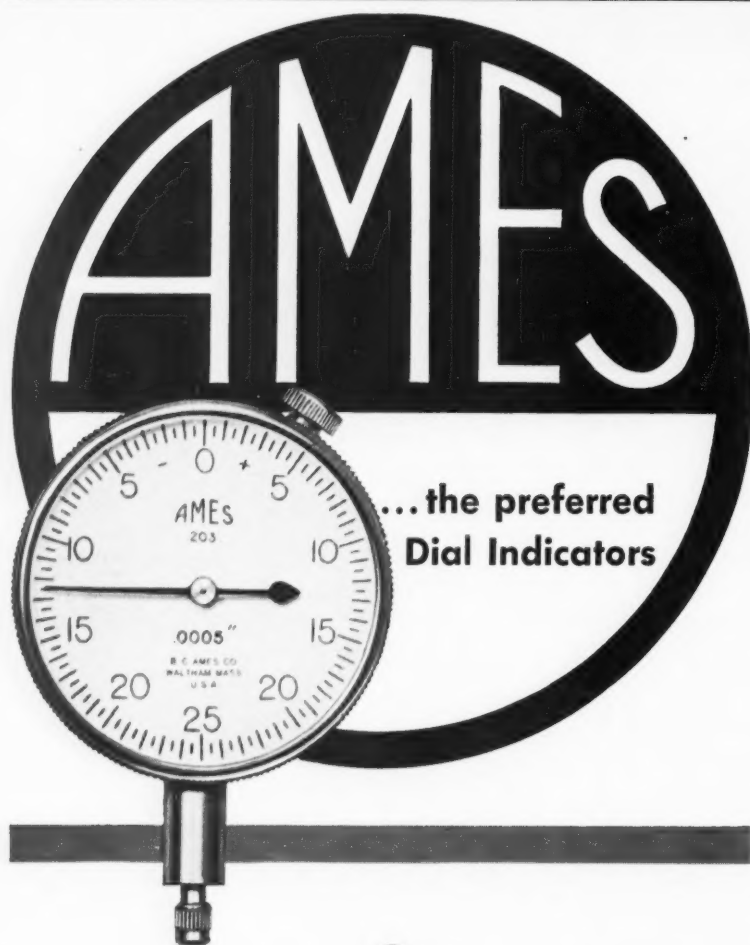


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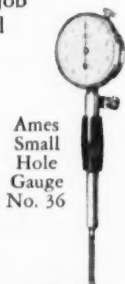


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Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.  
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit  
32, Mich.  
Ingersoll Milling Mch. Co., 2442 Douglas St.,  
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Hannafin Corp., 1101 S. Kilbourn Ave., Chi-  
cago.  
Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton,  
Pa.  
Mead Specialties Co., 4114 North Knox Ave.,  
Chicago 41, Ill.  
National Pneumatic Co., Inc., 127 Armory St.,  
Boston 19, Mass.  
Rivett Lathe & Grinder, Inc., Brighton, Boston  
35, Mass.  
Tomkins-Johnson Co., Jackson, Mich.

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Barnes, John S., Corp., Rockford, Ill.  
Hannafin Corp., 1101 S. Kilbourn Ave., Chicago,  
Ill.  
Hydraulic Press Mfg. Co., 300 Lincoln Ave.,  
Mt. Gilead, Ohio.  
Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton,  
Pa.  
Logansport Machine Co., Inc., 810 Center Ave.,  
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National Forge & Ordance Co., Irvine, Warren  
County, Pa.  
National Pneumatic Co., Inc., 127 Armory St.,  
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Wis.  
Rivett Lathe & Grinder, Inc., Brighton, Boston  
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Heald Mch. Co., 10 New Bond St., Worcester 6,  
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Lufkin Rule Co., Hess Ave., Saginaw, Mich.  
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land 3, Ohio.  
Beaver Tool & Engineering Corp., 2850 Ro-  
chester Rd., Box 429, Royal Oak, Mich.  
Hartford Special Mchry. Co., 287 Homestead  
St., Hartford, Conn.  
Pioneer Engrg. & Mfg. Co., 19679 John R St.,  
Detroit, Mich.  
Pioneer Pump & Mfg. Co., 19679 John R St.,  
Detroit, Mich.  
Pratt & Whitney, West Hartford 1, Conn.  
Sheffield Corp., 721 Springfield, Dayton, Ohio.  
Snyder Tool & Engrg. Co., 3400 E. Lafayette,  
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#### DIE-CASTING MACHINES

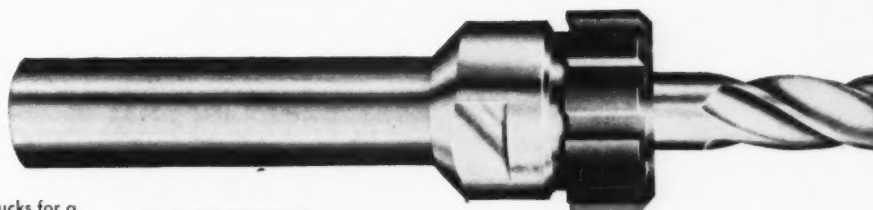
Hydraulic Press Mfg. Co., Mt. Gilead, Ohio.  
Lake Erie Engineering Corp., Kenmore Station,  
Buffalo, N. Y.  
Reed-Prentice Corp., 677 Cambridge St., Wor-  
cester, Mass.

(Continued on page 370)

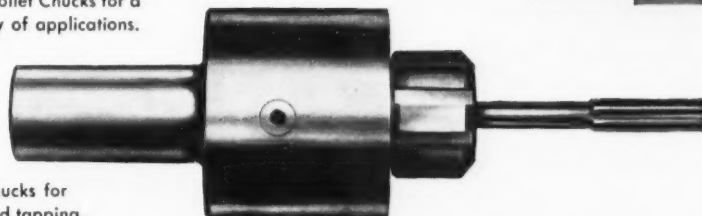
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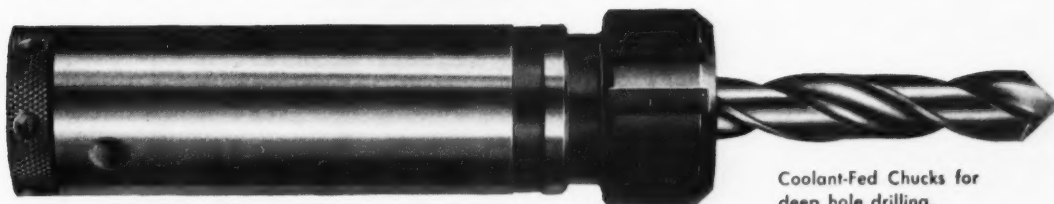
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- wrap-around gripping action eliminates scored tool shanks.
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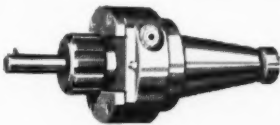
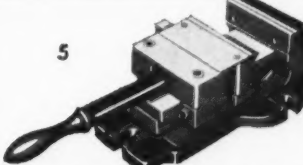

Standard Collet Chucks for a wide variety of applications.



Floating Chucks for reaming and tapping.



Coolant-Fed Chucks for deep hole drilling.

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| <p>2</p>  | <p>6</p>  |   |
| <p>3</p>  | <p>7</p>  |   |
| <p>4</p>  | <p>8</p>  |   |



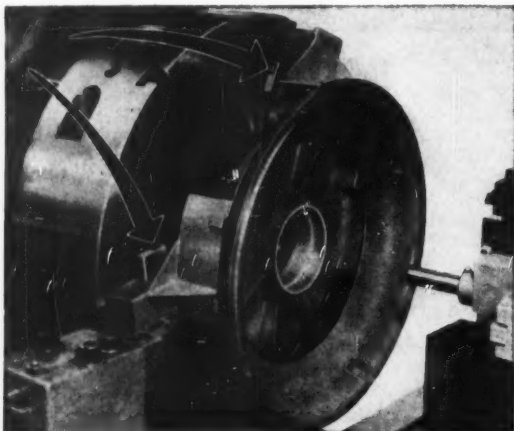


### *for precision adjustment of lathe chucks*

Designed for easy installation on any top jaw used on an American Standard Serrated Jaw Chuck. Top jaws are then interchangeable on any chuck of American Standard Serrated type. Precision adjustment is made by using the hex wrench furnished with the Jaw-Set. Only one screw is required to control microadjustment.

### *The rigidity of a non-adjustable chuck plus complete precision adjustment of each jaw!*

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Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.  
Kennametal, Inc., Latrobe, Pa.  
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Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

#### **DIEMAKERS' SUPPLIES**

Allied Products Corp., 12677 Burt Rd., Detroit 23, Mich.  
Danly Mch. Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.  
Detroit Die Set Corp., 2895A W. Grand Blvd., Detroit 2, Mich.  
Producto Mch. Co., 990 Housatonic Ave., Bridgeport, Conn.  
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

#### **DIEMAKING MACHINES**

Grab Bros., Grafton, Wis.  
Kearney & Trecker Corp., Milwaukee, Wis.  
New England Mch. & Tl. Co., (Electronic) Berlin, Conn.  
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.  
Precise Products Corp., 1328-30 Clark St., Racine, Mich.

#### **DIE SETS, Standard**

Danly Mch. Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.  
Detroit Die Set Corp., 2895A W. Grand Blvd., Detroit 2, Mich.  
Pratt & Whitney, West Hartford 1, Conn.  
Producto Mch. Co., 990 Housatonic Ave., Bridgeport, Conn.  
U. S. Tool Co., Inc., 255 N. 18th St., Ampere, N. J.

#### **DIE-SINKING MACHINES**

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.  
Cincinnati Milling Mch. Co., Cincinnati, Ohio.  
Gorton, George, Machine Co., 1110 W. 13th St., Racine, Wis.  
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.  
Pratt & Whitney, West Hartford 1, Conn.  
Reed-Prentice Corp., 677 Cambridge St., Worcester, Mass.  
Turchan Follower Mch. Co., 8259 Livernois & Alaska Aves., Detroit, Mich.

#### **DIE-SINKING PRESSES**

Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.  
Kearney & Trecker Corp., Milwaukee, Wis.

#### **DIE STOCKS**

See Stocks, Die.

#### **DIES, Lettering and Embossing**

Hoggson & Pettis Mfg. Co., 149 Brewery St., New Haven, Conn.

#### **DIES, Sheet Metal, Etc.**

Allied Products Corp., 12677 Burt Rd., Detroit 23, Mich.  
Bath, Cyril, Co., 6984 Machinery Ave., Cleveland 3, Ohio.  
Bliss, E. W., Co., 1375 Raff Rd., S. W., Canton, Ohio.  
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.  
Chambersburg Engrg. Co., Chambersburg, Pa.  
Columbus Die-Tool & Mch. Co., 955 Cleveland Ave., Columbus, Ohio.  
Dreis & Krupp Mfg. Co., 7416 Loomis Blvd., Chicago 36, Ill.  
Ferracute Mch. Co., Bridgeton, N. J.  
John, B., Manufacturing Co., Ellis St., New Britain, Conn.  
Metal Carbides Corp., Youngstown, Ohio.  
Mullins Manufacturing Corp., Salem, Ohio.  
Niagara Mch. & Tool Wks., 683 Northland Ave., Buffalo, N. Y.  
Pioneer Pump & Mfg. Co., 19679 John R St., Detroit, Mich.

(Continued on page 372)

**\*REO DESIGN ENGINEERS SAID...**

# TOUGH JOB?

# WE'LL SPECIFY



Reo Motors, Lansing, Mich., have again specified STRESSPROOF—this time for the power shaft on their new rotary lawn mower.

# AGAIN!

**Another  
Reo Lawn Mower  
to Use STRESSPROOF**



Reo engineers needed *top performance* from this new drive shaft . . . so they insisted on STRESSPROOF! They knew from years of successful experience with STRESSPROOF that it could take abuse. It had both the strength and wearability to stand up under the toughest service—and its excellent machinability was most welcome from a cost standpoint.

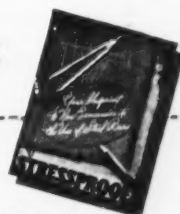
The alternative to STRESSPROOF would have been a heat-treated part, with the attendant cleaning, straightening, and machining problems.

Only STRESSPROOF gives you a unique combina-

tion of four qualities *in-the-bar*: Strength, Wearability, Machinability, and Minimum Warpage. Yet it costs less than the other quality cold-finished steel bars.

STRESSPROOF makes a better part at lower cost! It is available in cold-drawn or ground and polished finish.

SEND FOR . . .  
Free Engineering Bulletin,  
"New Economies in the Use  
of Steel Bars"



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## La Salle STEEL CO.

Manufacturers of the Most Complete  
Line of Carbon and Alloy Cold-Finished  
and Ground and Polished Steel Bars in America.

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For more information on products advertised, use Inquiry Card, page 239

MACHINERY, September, 1953—371



## pointing problems?

Torrington Swaging Machines produce pointed ends on both solid and tubular work to close tolerances. The swager, delivering 4000 hammer blows a minute, works rapidly and gives the metal toughness and resiliency. Swaging is economical, too, for there is no stock waste.



"The Torrington Swaging Machine" tells the story on the art of swaging, and describes the complete line of Torrington machines. This informative booklet is yours for the asking.

**THE TORRINGTON COMPANY**  
Swager Department

558 Field Street • Torrington, Conn.  
Makers of

**TORRINGTON NEEDLE BEARINGS**

Sheffield Corp., 721 Springfield, Dayton, Ohio.  
Taff-Pierce Mfg. Co., Woonsocket, R. I.  
V & O Press Co., Div. Emhart Mfg. Co., Hudson, N. Y.  
Version Allsteel Press Co., 93rd St. and S. Kenwood Ave., Chicago, Ill.  
Waltham Mch. Wks., Newton St., Waltham, Mass.

### DIES, Threading

Butterfield Div., Union Twist Drill Co., Derby Line, Vt.  
Card, S. W., Mfg. Co., Mansfield, Mass.  
Detroit Tap & Tool Co., 8615 E. 8 Mile Rd., Base Line, Mich.  
Eastern Mch. Screw Corp., New Haven, Conn.  
Geometric Tool Co., Westville Station, New Haven 15, Conn.  
Greenfield Tap & Die Corp., Greenfield, Mass.  
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.  
Morse Twist Drill & Mch. Co., New Bedford, Mass.  
National Acme Co., 170 E. 131st St., Cleveland, Ohio.  
Pratt & Whitney, West Hartford 1, Conn.  
Sheffield Corp., 721 Springfield, Dayton, Ohio.  
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.  
Winter Bros. Co., Rochester, Mich.

### DIES, Threading, Opening

Eastern Mch. Screw Corp., New Haven, Conn.  
Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, S. I., N. Y.  
Geometric Tool Co., Westville Station, New Haven 45, Conn.  
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.  
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.  
Landis Mch. Co., Waynesboro, Pa.  
National Acme Co., 170 E. 131st St., Cleveland, Ohio.  
Sheffield Corp., 721 Springfield, Dayton, Ohio.

### DIES, Thread Rolling

Detroit Tap & Tool Co., 8615 E. 8 Mile Rd., Base Line, Mich.  
Pratt & Whitney, West Hartford 1, Conn.  
Reed Rolled Thread Die Co., P. O. Box 350, Worcester 1, Mass.  
Sheffield Corp., 721 Springfield, Dayton, Ohio.

### DISCS, Abrasives

Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.  
Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.  
Norton Co., 1 New Bond St., Worcester, Mass.  
Simonds Abrasive Co., Tacony and Fraley Sts., Bridesburg, Philadelphia, Pa.  
Smit, J. K., & Sons, Inc., Murray Hill, N. J.  
Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

### DIVIDING HEADS

See Indexing and Spacing Equipment.

### DOWEL PINS

Allen Mfg. Co., 133 Sheldon St., Hartford 2, Conn.  
Danly Mch. Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.  
Detroit Die Set Corp., 2895A W. Grand Blvd., Detroit 2, Mich.  
Producto Machine Co., 990 Housatonic Ave., Bridgeport, Conn.  
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

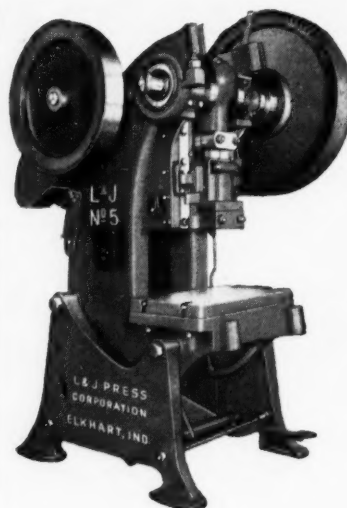
### DRAFTING MACHINES

Universal Drafting Mch. Corp., 7960 Lorain Ave., Cleveland, Ohio.

### DRESSERS, Grinding Wheel

Carboloy Dept., General Electric Co., Box 237 Roosevelt Park Annex, Detroit 32, Mich.  
Erickson Tools, Div. Erickson Steel Co., 2309 Hamilton, Cleveland, Ohio.  
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.  
Hoglund Engrg. & Mfg. Co., Inc., Berkeley Heights, N. J.  
Metal Carbides Corp., Youngstown, Ohio.  
Meyers, W. F. Co., Bedford, Ind.  
Moore Special Tool Co., Inc., 724 Union Ave., Bridgeport, Conn.  
Norton Co., 1 New Bond St., Worcester, Mass.  
Sheffield Corp., 721 Springfield, Dayton, Ohio.  
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.  
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.  
Vincor Corp., 9113 Schaefer Hwy., Detroit 28, Mich.  
Western Tool & Mfg. Co., 1640 E. Wheeler St., Springfield, Ohio.

(Continued on page 374)



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to find out how  
the productivity  
and accuracy of*

# L & J PRESSES

*can improve your  
output and reduce  
your costs.*

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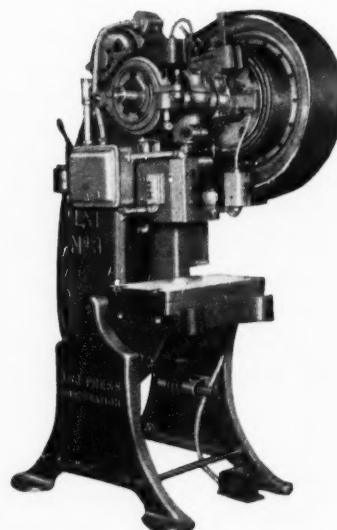
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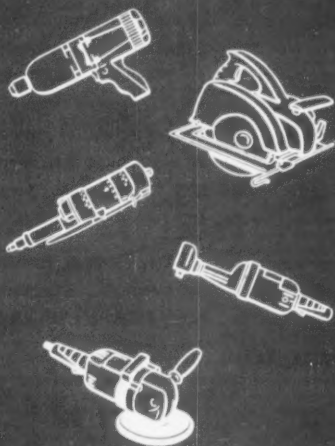
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Available with air clutches.

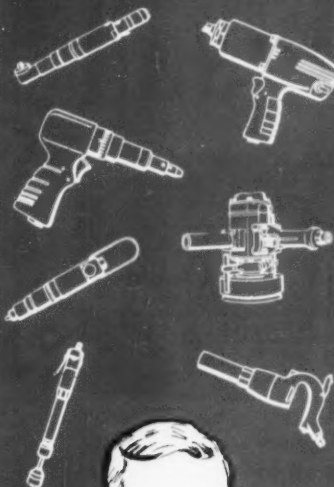


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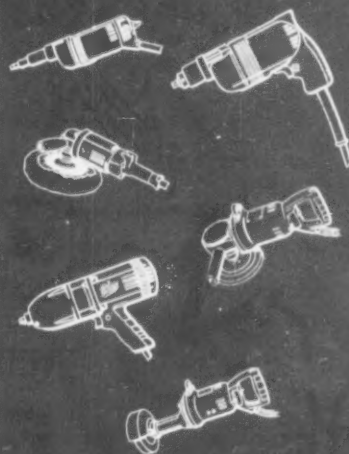
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60 years in the business, with over 1,500 different types of power tools available, **THOR POWER TOOL COMPANY** is well qualified to give you sound, impartial advice on *ALL* portable power tool problems.

*Thor—and only Thor—specializes exclusively in the manufacture of portable power tools . . . of ALL types.*

For money-saving, cost-cutting *IDEAS*, write for Thor Power Tool Catalogs or a "get acquainted" call from a Thor service engineer. Thor Power Tool Company, Aurora, Ill. *Sales and Service Offices in Principal Cities.*



*YOUR FILES ARE INCOMPLETE if you do not have the latest Thor Tool catalogs covering Thor Air Tools, Thor Universal Electric Tools, Thor 180 Cycle and 360 Cycle High Frequency Electric Tools. Use coupon below.*



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Please send catalog covering Thor

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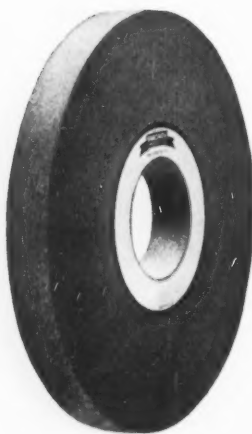
MACHINERY, September, 1953—373





**SIMONDS**  
ABRASIVE CO.

## Grinding Wheels



To turn out top quality production, take in top quality wheels . . . Simonds Grinding Wheels. They're second to none in quality, economy, dependability . . . and in the variety and completeness of the line they comprise. It includes grinding wheels, mounted wheels and points, segments and abrasive grain . . . everything you need for roughing, finishing, cutting off, sharpening, polishing. No matter what your jobs call for, call on your Simonds distributor for prompt service that gives you superior grinding wheel performance.

*Write for free data book and name of your Simonds Distributor.*

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Beaver Tool & Engineering Corp., 2850 Rochester Rd., Box 429, Royal Oak, Mich.  
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.  
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.  
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

### DRILL HEADS, Multiple Spindle

Baker Bros., Inc., Station F, P. O. Box 101, Toledo 10, Ohio.  
Barnes Drill Co., 814 Chestnut, Rockford, Ill.  
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.  
Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich.  
Candy-Otto Div., Cincinnati Lathe & Tool Co., Oakley, Cincinnati, Ohio.  
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.  
Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, S. I., N. Y.  
Ettco Tool Co., Inc., 592 Johnson Ave., Brooklyn, N. Y.  
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.  
Moline Tool Co., 102 20th St., Moline, Ill.  
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.  
Thriftmaster Products Corp., 1076 N. Plum St., Lancaster, Pa.  
United States Drill Head Co., 616 Burns, Cincinnati, Ohio.  
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

### DRILL HEADS, Unit Type

Barnes Drill Co., 814 Chestnut, Rockford, Ill.  
Beaver Tool & Engineering Corp., 2850 Rochester Rd., Box 429, Royal Oak, Mich.  
Bellows Co., 230 W. Market St., Akron, Ohio.  
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.  
Keller Tool Co., Grand Haven, Mich.  
Kingsbury Mch. Tool Corp., Keene, N. H.  
Magna Engineering Corp., 110 Linfield Drive, Menlo Park, Calif.  
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.  
Precise Products Corp., 1328-30 Clark St., Racine, Wis.  
Rehnberg-Jacobson Mfg. Co., 2135 Kishwaukee St., Rockford, Ill.  
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.

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National Twist Drill & Tool Co., Rochester, Mich.  
Pratt & Whitney, West Hartford 1, Conn.  
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.  
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.  
Union Twist Drill Co., Athol, Mass.  
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

### DRILL STANDS

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Greenfield Tap & Die Corp., Greenfield, Mass.  
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National Twist Drill & Tool Co., Rochester, Mich.  
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.  
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.  
Thor Power Tool Co., Aurora, Ill.  
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Baker Bros., Inc., Station F, P. O. Box 101, Toledo 10, Ohio.  
Barnes Drill Co., 814 Chestnut, Rockford, Ill.  
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.  
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.  
Bodine Corp., Mt. Grove St., Bridgeport, Conn.  
Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich.  
Consolidated Mch. Tool Corp., Rochester, N. Y.  
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.  
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(Continued on page 376)

**Avey** announces . . . A unique Indexing Machine

**It's NEW!**

A really great  
advance in the  
automatic drilling  
machine industry!

# ELECTRODEX

Machine Indexes from precision templates which may be changed in a matter of minutes.

Index Pattern may also be changed by Push Button Control.

Index templates, inexpensive, with immediate delivery.

Designed primarily for the Jet Engine Industry.

May be used on any Multiple Indexing arrangement where indexing patterns are complex.

Can be used on Drilling, Tapping, Milling, etc.

As many as three different hole patterns may be drilled by push button control without any relocation of part.

No hydraulics or Geneva Mechanism used.

Table actuated by standard D. C. Motor and simplified control panel using all standard electrical components employing line voltage. Conforms to J.I.C. Standards.

2-200 Indexes.

Even or uneven Indexes.

Push Button Control

Extreme Index Accuracy to .001.

30-36" Diameter.

Built-in checking device.

A special machine with  
**STANDARD machine**  
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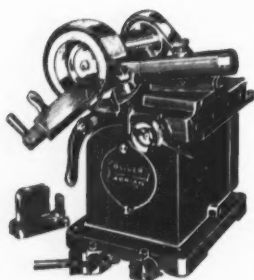


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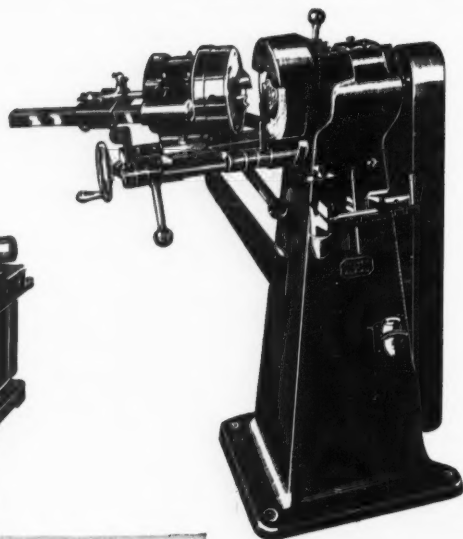
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# OLIVER DRILL POINTERS

**Pay for Themselves  
By Reducing Tool-Room Costs**



MODEL #21



MODEL #510

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No. 510 for drills  $\frac{1}{4}$ " to 3"—2-3-4 flute. Variable clearances. Variable point angles. Full automatic operation.

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AUTOMATIC DRILL GRINDERS  
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National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.  
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.  
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.  
Turner Bros., Inc., 2625 Hilton Rd., Ferndale 20, Mich.  
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

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Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.  
Dumore Co., 1300 17th St., Racine, Wis.  
Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.  
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.  
Hamilton Tool Co., 834 South 9th St., Hamilton, Ohio.  
Henry & Wright Div., Emhart Mfg. Co., 760 Windsor St., Hartford 1, Conn.  
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.  
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.  
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.  
Thor Power Tool Co., Aurora, Ill.  
Walker-Turner Div., Kearney & Trecker Corp., 900 North Ave., Plainfield, N. J.

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Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.  
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.  
Pratt & Whitney, West Hartford 1, Conn.

### DRILLING MACHINES, Gang

Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.  
Baker Bros., Inc., Station F, P. O. Box 101, Toledo 10, Ohio.  
Barnes Drill Co., 814 Chestnut, Rockford, Ill.  
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.  
Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.  
Cleereman Mch. Tool Co., Green Bay, Wis.  
Consolidated Mch. Tool Corp., Rochester, N. Y.  
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.  
Foote-Burt Co., 1300 St. Clair Ave., Cleveland 8, Ohio.  
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.  
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.  
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.  
Magna Engineering Corp., 110 Linfield Drive, Menlo Park, Calif.  
Milliholland, W. K. Mchry. Co., 6402 Westfield Blvd., Indianapolis 5, Ind.  
Moline Tool Co., 102 20th St., Moline, Ill.  
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.  
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.  
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.  
Turner Bros., Inc., 2625 Hilton Rd., Ferndale 20, Mich.

### DRILLING MACHINES,

#### Horizontal Duplex

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Baker Bros., Inc., Station F, P. O. Box 101, Toledo 10, Ohio.  
Barnes Drill Co., 814 Chestnut, Rockford, Ill.  
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.  
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.  
Consolidated Mch. Tool Corp., Rochester, N. Y.  
Davis & Thompson Co., 6411 W. Burnham St., Milwaukee 14, Wis.  
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.  
Kingsbury Mch. Tool Corp., Keene, N. H.  
Magna Engineering Corp., 110 Linfield Drive, Menlo Park, Calif.  
Milliholland, W. K. Mchry. Co., 6402 Westfield Blvd., Indianapolis 5, Ind.  
Moline Tool Co., 102 20th St., Moline, Ill.

(Continued on page 378)

**DOUBLE CIRCLE TOOLS**

**greater cutting mileage**

**CLOSER TOLERANCES . . .**  
**TOP PERFORMANCE . . .**  
**LONGER TIME BETWEEN SHARPENINGS**

GREATER CUTTING MILEAGE gives users of Double Circle Tools the economical performance so important to efficient manufacturing. Longer time between sharpenings means more steady production resulting in a savings in time and money. Longer life . . . is the extra value that stretches every dollar you invest in tools. Top performance is the smooth precise operation that users enjoy . . . enabling them to turn out better workmanship with less effort.

CHICAGO-LATROBE has demonstrated that all the extra time, thought and expense placed on careful quality control has produced TOP QUALITY TOOLS of real benefit to users. That's why it pays to specify Double Circle Tools . . . and enjoy GREATER CUTTING MILEAGE.

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MACHINERY, September, 1953—377



# 343 pcs. per hour!

## Drills and Taps 4 Holes in 12 different parts

*Another Cleveland Design  
to Speed Production!*



production  
tapping  
guide

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of this  
Guide

The power driven 6 station drum index unit of this new Cleveland machine is designed to accommodate 12 different parts. No clamping is required—the parts automatically drop off into a chute. The 4 spindle multiple head is adjustable. Estimated production at 100% efficiency is 343 pieces per hour.

With the precision lead screw feed more perfect pieces per hour are possible on Cleveland machines. By combining several operations in one machine and tapping groups of holes at one stroke Cleveland engineers are able to realize greater speed with proportionately lower operating costs.

It will pay you to put your production problems up to Cleveland engineers. Their know-how has never failed to cut production costs.

Write today for Catalog No. MA-93

**THE CLEVELAND TAPPING MACHINE CO.**

A Subsidiary of AUTOMATIC STEEL PRODUCTS, INC.

**CANTON 6, OHIO**

*For Better Tapping -- Faster!*  
**CLEVELAND** lead  
tapping machines screw



Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.  
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.  
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.  
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.  
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

### DRILLING MACHINES,

#### Horizontal Portable

Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.

### DRILLING MACHINES, Inverted

Baker Bros., Inc., Station F, P. O. Box 101, Toledo 10, Ohio.  
Barnes Drill Co., 814 Chestnut, Rockford, Ill.  
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.  
Magna Engineering Corp., 110 Linfield Drive, Menlo Park, Calif.  
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.  
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.  
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.

### DRILLING MACHINES, Multiple Center

#### Column Type

Barnes Drill Co., 814 Chestnut, Rockford, Ill.  
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.  
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.

### DRILLING MACHINES, Multiple Spindle

Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.  
Baker Bros., Inc., Station F, P. O. Box 101, Toledo 10, Ohio.  
Barnes Drill Co., 814 Chestnut, Rockford, Ill.  
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.  
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.  
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.  
Canedy-Otto Div., Cincinnati Lathe & Tool Co., Oakley, Cincinnati, Ohio.  
Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.  
Cleereman Mch. Tool Co., Green Bay, Wis.  
Cosa Corp., 405 Lexington Ave., New York 17.  
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.  
Davis & Thompson Co., 6411 W. Burnham St., Milwaukee 14, Wis.  
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.  
Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.  
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.  
Greenlee Bros. & Co., 12th and Columbia Ave., Rockford, Ill.  
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.  
Henry & Wright Div., Emhart Mfg. Co., 760 Windsor St., Hartford 1, Conn.  
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.  
Kingsbury Mch. Tool Corp., Keene, N. H.  
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.  
Magna Engineering Corp., 110 Linfield Drive, Menlo Park, Calif.  
Milliholland, W. K., Mchry. Co., 6402 Westfield Blvd., Indianapolis 5, Ind.  
Moline Tool Co., 102 20th St., Moline, Ill.  
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.  
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.  
Pratt & Whitney, West Hartford 1, Conn.  
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.  
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.  
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.  
Turner Bros., Inc., 2625 Hilton Rd., Ferndale 20, Mich.  
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

### DRILLING MACHINES, Radial

American Tool Works Co., Pearl and Eggleston Aves., Cincinnati, Ohio.  
Canedy-Otto Div., Cincinnati Lathe & Tool Co., Oakley, Cincinnati, Ohio.  
Carlton Mch. Tool Co., 3000 Spring Grove Ave., Cincinnati 25, Ohio.

(Continued on page 380)

# OK milling cutters hogmills centerslot of counterweight forging for world's most powerful piston aircraft engine

Great advancements have been made in the art of milling metal in recent years, especially in the aircraft industry. And, no where is this better exemplified than at the new Pratt & Whitney Aircraft plant at North Haven. Here, everything is ideal. Ample room for every operation. Hundreds of milling machines, all kinds, sizes. Thousands of metals cutting tools. Here, you get a realistic definition of the meaning of close tolerances.

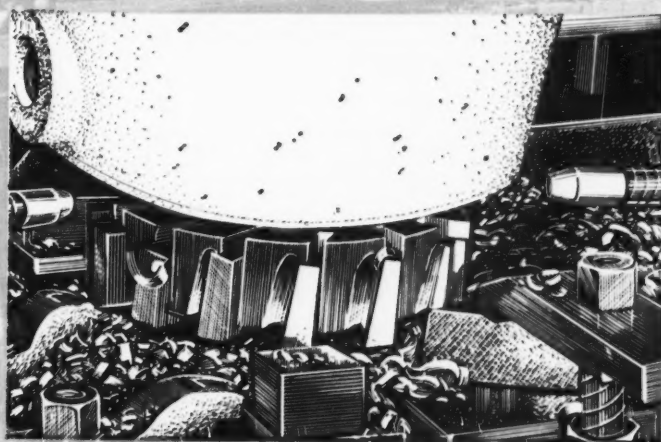
In the illustration, an OK face mill is rough-milling a slot  $3/16 \times 8''$  in a tough steel forging for a counterweight used in the Wasp Major engine.

OK milling cutters are favorites of the aircraft industry—engine builders, frame manufacturers, component part makers. OK cutters have more beef in the body, are heavier size for size.

Blades once driven home, sit secure, unmovable.

Mated serrations prevent side-sway and form an accurate measurement for blade advancement to compensate for wear.

Mills with this fine adjustment feature reduce grinding to less than .005" per blade.



OK MILLING CUTTER ON A MILWAUKEE VERTICAL SEMI FINISH—MILLS SLOT OF A TOUGH AIRCRAFT STEEL FORGING AT NEW PRATT & WHITNEY AIRCRAFT PLANT, NORTH HAVEN, CONNECTICUT.

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"MODERN MILLING CUTTERS FOR MODERN MILLING MACHINES"  
"AMERICA'S FIRST SYSTEM OF SINGLE POINT TOOLS"

TWO COMPONENTS—BODY AND BLADES

SIMPLE . . .

STRONG . . .

SUFFICIENT . . .



modern milling cutters for  
modern milling machines

THE O.K. TOOL COMPANY, INC.

Milford 6, New Hampshire

For more information on products advertised, use Inquiry Card, page 239

MACHINERY, September, 1953—379

Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.  
Cincinnati Gilbert Machine Tool Co., 3366 Beekman St., Cincinnati 23, Ohio.  
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.  
Foote-Burt Co., 1300 St. Clair Ave., Cleveland, Ohio.  
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.  
Kaukauna Machine Corp., Kaukauna, Wis.  
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.  
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.

### DRILLING MACHINES, Rail

See Drilling Machines, Gang.

### DRILLING MACHINES, Sensitive

Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.  
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.  
Canedy-Ohio Div., Cincinnati Lathe & Tool Co., Oakley, Cincinnati, Ohio.  
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.  
Deita Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.  
Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.  
Foote-Burt Co., 1300 St. Clair Ave., Cleveland, Ohio.  
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.  
Hamilton Tool Co., 834 South 9th St., Hamilton, Ohio.  
Henry & Wright Div., Emhart Mfg. Co., 760 Windsor St., Hartford 1, Conn.  
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.  
Magna Engineering Corp., 110 Linfield Drive, Menlo Park, Calif.  
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.  
Pratt & Whitney, West Hartford 1, Conn.  
Ryerson, Jos. T. & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.  
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.  
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.

### DRILLING MACHINES, Upright

Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.  
Baker Bros. Inc., Station F, P. O. Box 101, Toledo 10, Ohio.  
Barnes Drill Co., 814 Chestnut, Rockford, Ill.  
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.  
Baush Mch. Tool Co., 156 Wason Ave., Springfield 7, Mass.  
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.  
Canedy-Ohio Div., Cincinnati Lathe & Tool Co., Oakley, Cincinnati, Ohio.  
Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.  
Cleereman Mch. Tool Co., Green Bay, Wis.  
Consolidated Mch. Tool Corp., Rochester, N. Y.  
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.  
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.  
Foote-Burt Co., 1300 St. Clair Ave., Cleveland 8, Ohio.  
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.  
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.  
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.  
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.  
Magna Engineering Corp., 110 Linfield Drive, Menlo Park, Calif.  
Moline Tool Co., 102 20th St., Moline, Ill.  
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.  
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.  
Rehnberg-Jacobson Mfg. Co., 2135 Kishwaukee St., Rockford, Ill.  
Ryerson, Jos. T. & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.  
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.  
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.  
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.

### DRILLING MACHINES, Wall Radial

Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.  
Consolidated Mch. Tool Corp., Rochester, N. Y.

### DRILLS, Center

Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.  
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.

Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.  
Greenfield Tap & Die Corp., Greenfield, Mass.  
Kee Cutoffs, 19326 Woodward, Detroit, Mich.  
Morse Twist Drill & Mch. Co., New Bedford, Mass.  
National Twist Drill & Tool Co., Rochester, Mich.  
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.  
Union Twist Drill Co., Athol, Mass.  
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

### DRILLS, Core

Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.  
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.  
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.  
Eclipse Counterbore Co., 1600 Bonner Ave., Ferndale, Mich.  
Erickson Tools Div., Erickson Steel Co., 2309 Hamilton, Cleveland, Ohio.  
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.  
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.  
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.  
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.  
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.  
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.  
Morse Twist Drill & Mch. Co., New Bedford, Mass.  
National Twist Drill & Tool Co., Rochester, Mich.  
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.  
Smit, J. K., & Sons, Inc., Murray Hill, N. J.  
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.  
Union Twist Drill Co., Athol, Mass.  
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.  
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.  
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

### DRILLS, Deep Hole

Pratt & Whitney, West Hartford 1, Conn.  
Smit, J. K., & Sons, Inc., Murray Hill, N. J.  
Union Twist Drill Co., Athol, Mass.  
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

### DRILLS, Portable Electric

Black & Decker Mfg. Co., Towson, Md.  
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.  
Dumore Co., 1300 17th St., Racine, Wis.  
Millers Falls Co., Greenfield, Mass.  
Precise Products Corp., 1328-30 Clark St., Racine, Wis.  
Ryerson, Jos. T. & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.  
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.  
Thor Power Tool Co., Aurora, Ill.  
United States Electrical Tool Div., Emerson Elec. Mfg. Co., 1050 Findlay St., Cincinnati 14, Ohio.

### DRILLS, Portable Pneumatic

Air Conversion Research Corp., 4107 N. Damen Ave., Chicago 18, Ill.  
Bellows Co., 230 W. Market St., Akron, Ohio.  
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.  
Cieco Div., Reed Roller Bit Co., 5125 Clinton Ave., Houston 20, Texas.  
Ingersoll-Rand Co., Phillipsburg, N. J.  
Keller Tool Co., Grand Haven, Mich.  
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.  
Thor Power Tool Co., Aurora, Ill.

### DRILLS, Rechet

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.  
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.  
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.  
Greenfield Tap & Die Corp., Greenfield, Mass.  
Morse Twist Drill & Mch. Co., New Bedford, Mass.  
National Twist Drill & Tool Co., Rochester, Mich.  
Pratt & Whitney, West Hartford 1, Conn.  
Union Twist Drill Co., Athol, Mass.  
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

### DRILLS, Twist

Besly-Welles Corp., Beloit, Wis.  
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.  
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.

Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.  
Greenfield Tap & Die Corp., Greenfield, Mass.  
Morse Twist Drill & Mch. Co., New Bedford, Mass.  
National Twist Drill & Tool Co., Rochester, Mich.  
Pratt & Whitney, West Hartford 1, Conn.  
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.  
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.  
Union Twist Drill Co., Athol, Mass.  
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

### DRILLS, Wire

Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.  
Greenfield Tap & Die Corp., Greenfield, Mass.  
Morse Twist Drill & Mch. Co., New Bedford, Mass.  
National Twist Drill & Tool Co., Rochester, Mich.  
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.  
Union Twist Drill Co., Athol, Mass.  
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

### DRIVES, Chain

Link-Belt Co., 220 S. Belmont Ave., Indianapolis 6, Ind.

### DUPLICATORS

Gorton, George, Mch. Co., 1110 W. 13th St., Racine, Wis.  
New England Mch. & Tl. Co. (Electronic), Berlin, Conn.  
Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa.  
Pratt & Whitney, West Hartford 1, Conn.  
Rickford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.  
Turchan Follower Mch. Co., 8259 Livernois, Detroit, Mich.

### DUST COLLECTORS

Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.  
Pangborn Corp., Hagerstown, Md.

### DUST CONTROL SYSTEMS

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National Pneumatic Co., Inc., 127 Army St., Boston 19, Mass.  
Westinghouse Electric Corp., Pittsburgh 30, Pa.

### EMERY WHEEL DRESSERS

See Dressers, Grinding Wheel.

### EMERY WHEELS

See Grinding Wheels

### ENGRAVING MACHINES

Cosa Corp., 405 Lexington Ave., New York 17, N. Y.  
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.  
Precise Products Corp., 1328-30 Clark St., Racine, Wis.

### EXTRACTORS, Screw

Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.  
Greenfield Tap & Die Corp., Greenfield, Mass.  
Morse Twist Drill & Mch. Co., New Bedford, Mass.  
Union Twist Drill Co., Athol, Mass.  
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

### FACING MACHINES

Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.  
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.

### FANS, Exhaust, Electric Ventilating

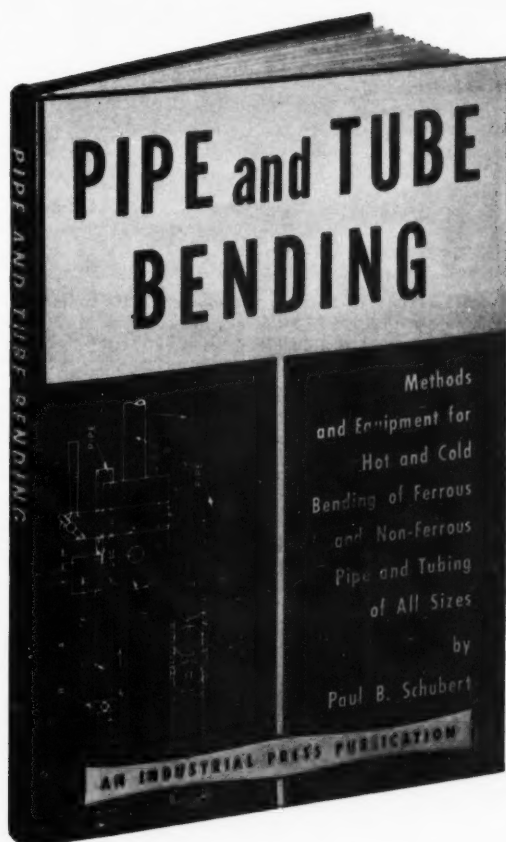
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.  
General Electric Co., Schenectady 5, N. Y.

### FEEDS FOR PRESSES, Automatic

Bellows Co., 230 W. Market St., Akron, Ohio.  
Federal Press Co., 600 Division and Big Four R. R., Elkhart, Ind.  
Nilson, A. H., Mch. Co., 1506 Railroad Ave., Bridgeport, Conn.  
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.  
V & O Press Co., Div. Emhart Mfg. Co., Hudson, N. Y.

(Continued on page 384)





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183 Pages  
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**NOW** you can make  
Special and Production gages

using your

# GAGE BLOCKS with new DoALL MICRO-STEP GAGING SYSTEM

HERE, for the first time is the means for directly applying gage blocks to thousands of precision measurement jobs which previously could be checked only with less accurate gaging setups.

—the means for securing micro-inch accuracy on *inside* as well as outside measurements.

—the means for assembling gage-block gages of every conceivable type, including gages up to 72" long.

—the means for making pin gages, snap gages, indicating gages, height gages, depth gages, go and no-go gages for use not only in the lab, but in the toolroom and shop as well.

Here, in short, is a practical, economical means of securing superior dimensional quality control, of reducing rejects and wasted time, material and money.

Key to the system are the new DoALL Gage Holders and gage block-accurate End Standards with full exposed measuring surfaces. No other gage system offers such a combination.

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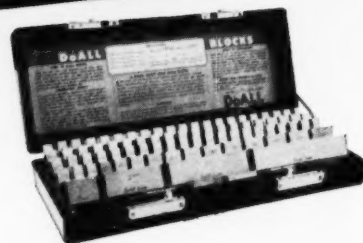
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**DoALL**

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New Catalog describes the DoALL Micro-Step Gaging System in detail, lists all gage block, end standard and holder sets. Free on request.

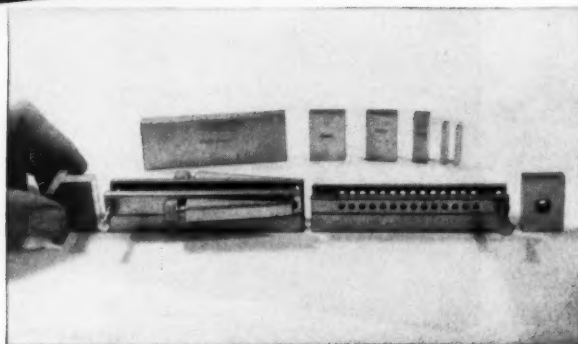
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Accuracy second to none in the world. Most complete line of sets available, 6 to 118 pieces, including a new set having gage blocks up to 20.000" long.

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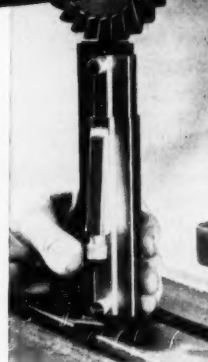


1. Select the holder, end standards and gage block combination for any gage you need.

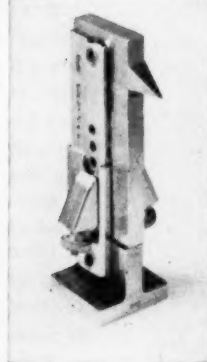
YOU MAKE GAGES LIKE THESE . . .



Internal gage-block gage calibrating indicating snap gage.



Assembled height gage for checking milling cutter setting.



Height gage with scribe end standard for layout work.

GS-13R



Monolite



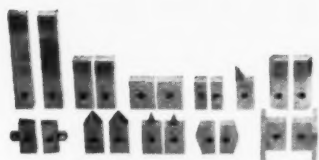
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Vernier Gage Blocks



Sine Bars and Plates



### NEW DoALL END STANDARDS

Here are gage block-accurate End Standards with fully exposed measuring surfaces which, when used with DoALL Gage Holders, make possible gage-block gages for every internal or external measuring job.



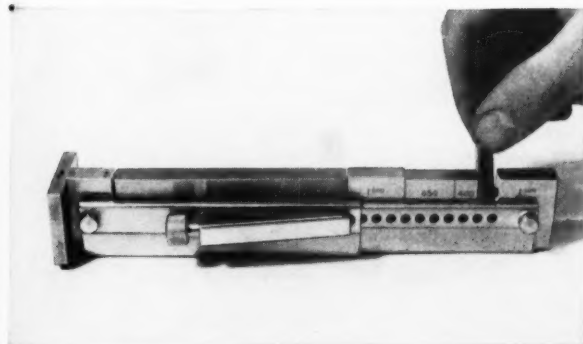
### NEW DoALL GAGE HOLDERS

Channel-type holders available for making gages from 2" to 72" length. Quickly, easily assembled. Also a caliper holder for gages up to 6". For use only with DoALL End Standards and standard rectangular gage blocks.



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**2.** Assemble holder, snap detent pins through end standards and insert correct gage block combination.



**3.** Press clamps into channel holes and tighten thumb screws snugly. That is all there is to it.



• Internal indicating pin gage checking parts in the shop.



Pre-calibrated indicating comparator made with DoALL parts.



Micro-inch accurate indicating snap gage in use in the shop.



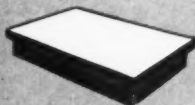
Go and no-go gage assembled with Micro-Step components.



This millionths-accurate indicating height gage is six feet long!



Electric Comparators



Granite Surface Plates



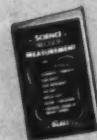
Mobile Inspection Unit



Gage Calibration Service



Gage Height Tables



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**FELT, For All Applications**

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Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.

**FILES, Hand**

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DoAll Co., 254 Laurel Ave., Des Plaines, Ill.  
Heller Bros. Co., Newcomerstown, Ohio.  
Nicholson File Co., 23 Acorn St., Providence, R. I.  
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.

**FILES, Machine**

Atkins Saw Div., Borg-Warner Corp., 402 South Illinois St., Indianapolis 9, Ind.  
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.  
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.

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Peck, Stow & Wilcox Co., Southington, Conn.  
Pratt & Whitney, West Hartford 1, Conn.  
Precision Products Corp., 1328-30 Clark St., Racine, Wis.  
Thor Power Tool Co., Aurora, Ill.  
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

**FILING MACHINES, Dies, Etc.**

DoAll Co., 254 Laurel Ave., Des Plaines, Ill.  
Grob Bros., Grafton, Wis.  
Illinois Tool Works, 2501 North Keeler Ave., Chicago, Ill.  
Jarvis, Chas. L. Co., Middletown, Conn.  
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.

**FILTERS, Air**

Air Conversion Research Corp., 4107 N. Damen Ave., Chicago 18, Ill.  
Bellows Co., 230 W. Market St., Akron, Ohio.  
Keller Tool Co., Grand Haven, Mich.

**FILTERS, Coolant and Oil**

Air Conversion Research Corp., 4107 N. Damen Ave., Chicago 18, Ill.  
Barnes Drill Co., 814 Chestnut St., Rockford, Ill.  
Cuno Engrg. Corp., Meriden, Conn.

**FINISHES FOR MACHINES AND METAL PARTS**

Lowe Bros. Co., Dayton, Ohio.

**FLEXIBLE COUPLINGS**

See Couplings, Flexible.

**FLEXIBLE SHAFT EQUIPMENT**

Dumore Co., 1300 17th St., Racine, Wis.  
Jarvis, Chas. L. Co., Middletown, Conn.  
Orban, Kurt Co., Inc., 205 East 42nd St., New York 17, N. Y.  
Pratt & Whitney, West Hartford 1, Conn.  
Precision Products Corp., 1328-30 Clark St., Racine, Wis.  
Walker-Turner Div., Kearney & Trecker Corp., 900 North Ave., Plainfield, N. J.

**FORGING (Upsetting) MACHINES**

Ajax Mfg. Co., Euclid, Cleveland 17, Ohio.  
Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.  
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.  
National Machinery Co., Greenfield and Stanton Sts., Tiffin, Ohio.  
Orban, Kurt Co., Inc., 205 East 42nd St., New York 17, N. Y.

**FORGINGS, Drop**

Bethlehem Steel Co., Bethlehem, Pa.

**FORGINGS, Hollow Bored**

Bethlehem Steel Co., Bethlehem, Pa.  
National Forge & Ordnance Co., Irvine, Warren County, Pa.

**FORGINGS, Iron and Steel**

Bethlehem Steel Co., Bethlehem, Pa.  
Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.  
Morgan Engrg. Co., Alliance, Ohio.  
National Forge & Ordnance Co., Irvine, Warren County, Pa.

**FORGINGS, Upset**

Bethlehem Steel Co., Bethlehem, Pa.

**FORMING AND BENDING MACHINES**

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.  
Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.  
Bath, Cyril Co., 6984 Machinery Ave., Cleveland 3, Ohio.  
Bethlehem Steel Co., Bethlehem, Pa.  
Chambersburg Engrg. Co., Chambersburg, Pa.  
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.  
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.  
Consolidated Mch. Tool Corp., Rochester, N. Y.  
Dreis & Krump Mfg. Co., 7416 Loomis Blvd., Chicago 36, Ill.  
Ferracute Machine Co., Bridgeton, N. J.  
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.  
Hufford Machine Works, Inc., 1700 E. Grand Ave., El Segundo, Calif. (Stretch-Wrap).  
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.  
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.  
O'Neil-Irwin Mfg. Co., Lake City, Minn.  
Peck, Stow & Wilcox Co., Southington, Conn.  
Yoder Co., 5500 Walworth, Cleveland, Ohio.

**FORMING AND STAMPING MACHINES**

Chambersburg Engrg. Co., Chambersburg, Pa.  
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.  
Dreis & Krump Mfg. Co., 7416 Loomis Blvd., Chicago 36, Ill.  
Henry & Wright Div., Emhart Mfg. Co., 760 Windsor St., Hartford 1, Conn.  
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.  
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.  
Nilson A. H., Mch. Co., 1506 Railroad Ave., Bridgeport, Conn.  
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.  
V & O Press Co., Div. Emhart Mfg. Co., Hudson, N. Y.

**FORMING TOOLS or Tool Blanks**

Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.  
Brown & Sharpe Mfg. Co., Providence, R. I.  
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.  
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.  
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.  
Kennametal, Inc., Latrobe, Pa.  
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.  
Pratt & Whitney, West Hartford 1, Conn.  
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

**FRAMES, Machinery Welded**

Mahon, R. H. Co., Detroit 34, Mich.

**FURNACES, Heat-Treating**

General Electric Co., Schenectady 5, N. Y.  
Westinghouse Electric Corp., Pittsburgh 30, Pa.

**FURNITURE, Shop**

Standard Pressed Steel Co., Jenkintown, Pa.  
Western Tool & Mfg. Co., 1640 E. Wheeler St., Springfield, Ohio.

**GAGE BLOCKS**

Brown & Sharpe Mfg. Co., Providence, R. I.  
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.  
Pratt & Whitney, West Hartford 1, Conn.  
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.  
Taft-Peirce Mfg. Co., Woonsocket, R. I.  
Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass.

**GAGES, Air**

Coca Corp., 405 Lexington Ave., New York 17.  
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.  
Federal Products Corp., P. O. Box 1027, Providence, R. I.  
Pratt & Whitney, West Hartford 1, Conn.  
Sheffield Corp., 721 Springfield, Dayton, Ohio.  
Taft-Peirce Mfg. Co., Woonsocket, R. I.

**GAGES, Comparator**

Ames, B. C., Co., Waltham 54, Mass.  
Comtor Co., 47 Farwell St., Waltham 54, Mass.  
Coca Corp., 405 Lexington Ave., New York 17.  
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.  
Federal Products Corp., P. O. Box 1027, Providence, R. I.  
Hanson-Whitney Co., Div. Whitney Chain Co., Hartford, Conn.  
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.

Pratt & Whitney, West Hartford 1, Conn.  
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.  
Sheffield Corp., 721 Springfield, Dayton, Ohio.  
Standard Gage Co., Inc., Poughkeepsie, N. Y.  
Taft-Peirce Mfg. Co., Woonsocket, R. I.

**GAGES, Depth**

Ames, B. C., Co., (Dial), Waltham 54, Mass.  
Brown & Sharpe Mfg. Co., Providence, R. I.  
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.  
Federal Products Corp., P. O. Box 1027, Providence, R. I.  
Hanson-Whitney Co., Div. Whitney Chain Co., Hartford, Conn.  
Homestrand, Inc., Larchmont, N. Y.  
Lufkin Rule Co., Hess Ave., Saginaw, Mich.  
Millers Falls Co., Greenfield, Mass.  
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.  
Sheffield Corp., 721 Springfield, Dayton, Ohio.  
Standard Gage Co., Inc., Poughkeepsie, N. Y.  
Starrett, The L. S. Co., Athol, Mass.  
Taft-Peirce Mfg. Co., Woonsocket, R. I.

**GAGES, Dial**

Ames, B. C., Co., Waltham 54, Mass.  
Brown & Sharpe Mfg. Co., Providence, R. I.  
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.  
Federal Products Corp., P. O. Box 1027, Providence, R. I.  
Homestrand, Inc., Larchmont, N. Y.  
Lufkin Rule Co., Hess Ave., Saginaw, Mich.  
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.  
Sheffield Corp., 721 Springfield, Dayton, Ohio.  
Standard Gage Co., Inc., Poughkeepsie, N. Y.  
Starrett, The L. S. Co., Athol, Mass.  
Taft-Peirce Mfg. Co., Woonsocket, R. I.

**GAGES, Electric**

Coca Corp., 405 Lexington Ave., New York 17.  
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.  
Federal Products Corp., P. O. Box 1027, Providence, R. I.  
Pratt & Whitney, West Hartford 1, Conn.  
Sheffield Corp., 721 Springfield, Dayton, Ohio.

**GAGES, Height**

Ames, B. C., Co., Waltham 54, Mass.  
Brown & Sharpe Mfg. Co., Providence, R. I.  
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.  
Homestrand, Inc., Larchmont, N. Y.  
Lufkin Rule Co., Hess Ave., Saginaw, Mich.  
Pratt & Whitney, West Hartford 1, Conn.  
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.  
Sheffield Corp., 721 Springfield, Dayton, Ohio.  
Starrett, The L. S. Co., Athol, Mass.

**GAGES, Plug, Ring and Snap**

Axelson Mfg. Co., P. O. Box 15335, Vernon Sta., Los Angeles 58, Calif.  
Brown & Sharpe Mfg. Co., Providence, R. I.  
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.  
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.  
Federal Products Corp., P. O. Box 1027, Providence, R. I.  
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.  
Greenfield Tap & Die Corp., Greenfield, Mass.  
Hanson-Whitney Co., Div. Whitney Chain Co., Hartford, Conn.  
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.  
Kennametal, Inc., Latrobe, Pa.  
Metal Carbides Corp., Youngstown, Pa.  
Morse Twist Drill & Mch. Co., New Bedford, Mass.  
Pratt & Whitney, West Hartford 1, Conn.  
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.  
Sheffield Corp., 721 Springfield, Dayton, Ohio.  
Standard Gage Co., Inc., Poughkeepsie, N. Y.  
Starrett, The L. S. Co., Athol, Mass.  
Taft-Peirce Mfg. Co., Woonsocket, R. I.  
Turner Bros. Inc., 2625 Hilton Rd., Ferndale 20, Mich.  
Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass.  
Vincor Corp., 9113 Schaefer Hwy., Detroit 28, Mich.  
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.  
Woodworth, N. A. Co., 1300 E. Nine Mile Rd., Detroit 20, Mich.

**GAGES, Surface**

Ames, B. C., Co., Waltham 54, Mass.  
Brown & Sharpe Mfg. Co., Providence, R. I.  
Columbus Die-Tool & Mch. Co., 955 Cleveland Ave., Columbus, Ohio.  
Hanson-Whitney Co., Div. Whitney Chain Co., Hartford, Conn.  
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.  
Lufkin Rule Co., Hess Ave., Saginaw, Mich.  
Millers Falls Co., Greenfield, Mass.  
Sheffield Corp., 721 Springfield, Dayton, Ohio.  
Starrett, The L. S. Co., Athol, Mass.

(Continued on page 386)



# THE BIG HYDRATROL STORY:

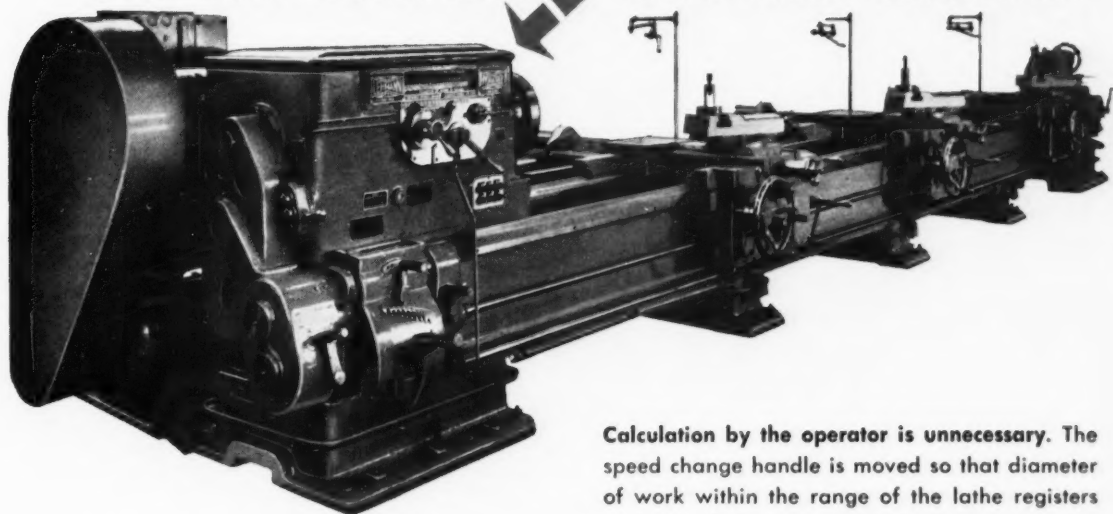
## 16 Spindle Speeds

*with only a*

## Twist of the Wrist...

*with This Automatic*

*Slide Rule Selection!*



Just a turn of the hand wheel on the front of the headstock of the LEHMANN Hydratrol Lathe gives you a speed change! An automatic slide rule, co-ordinated with the movement of the handle, shows spindle revolutions per minute and indicates a slide rule calculation of the cutting speeds in feet per minute.

Calculation by the operator is unnecessary. The speed change handle is moved so that diameter of work within the range of the lathe registers with specified cutting speed in feet per minute, and the lathe automatically makes the necessary change.

The rotary selector gives 16 forward and 8 reverse speeds. No need for intermediate stop; unnecessary to disengage the friction driving clutch to change speed.

### Check These Other Important Advantages:

- Safe in operation.
- Simplicity in construction and operation.
- Hydraulic friction clutches and hydraulic brakes, self-compensating.
- Automatic safety relay, for harmless and easy engagement of positive clutches when speeds are changed.
- Spindle release for chucking.
- Perfect, safety-control lubrication with filtered oil.
- Gears constantly in mesh.

Write today for additional information or catalog—or—send prints for time-and-money-saving recommendation!

## LEHMANN

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GRAND at CHOUTEAU • ST. LOUIS 3, MO.

DIVISION OF NOVO ENGINE CO.

For more information on products advertised, use Inquiry Card, page 239

MACHINERY, September, 1953—385



**GAGES, Taper**

Brown & Sharpe Mfg. Co., Providence, R. I.  
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.  
Pratt & Whitney, West Hartford 1, Conn.  
Sheffield Corp., 721 Springfield, Dayton, Ohio.  
Starrett, The L. S. Co., Athol, Mass.  
Taff-Peirce Mfg. Co., Woonsocket, R. I.

**GAGES, Thread**

Axelson Mfg. Co., P. O. Box 15335, Vernon  
Sta., Los Angeles 58, Calif.  
Detroit Tap & Tool Co., 8615 E. 8 Mile Rd.,  
Base Line, Mich.  
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.  
Federal Products Corp., P. O. Box 1027, Provi-  
dence, R. I.  
Greenfield Tap & Die Corp., Greenfield, Mass.  
Hanson-Whitney Co., Div. Whitney Chain Co.,  
Hartford, Conn.  
Pratt & Whitney, West Hartford 1, Conn.  
Sheffield Corp., 721 Springfield, Dayton, Ohio.  
Taff-Peirce Mfg. Co., Woonsocket, R. I.  
Woodworth, N. A., Co., 1300 E. Nine Mile Rd.,  
Detroit 20, Mich.

**GASKETS**

Crane Packing Co., 1800 Cuyler Ave., Chicago,  
Ill.  
Garlock Packing Co., Palmyra, N. Y.

**GEAR BLANKS, Non-Metallic**

Braun Gear Co., 239 Richmond, Brooklyn 8,  
N. Y.  
General Electric Co., Schenectady 5, N. Y.  
Westinghouse Electric Corp., Pittsburgh 30, Pa.

**GEAR BURNISHING MACHINES**

Fellows Gear Shaper Co., 78 River St., Spring-  
field, Vt.  
Sheffield Corp., 721 Springfield, Dayton, Ohio.

**GEAR CHAMFERING, ROUNDING AND  
BURRING MACHINES**

Bigram Gear & Mch. Works, 1217-35 Spring  
Garden St., Philadelphia, Pa.  
Consolidated Mch. Tool Corp., Rochester, N. Y.  
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.

Lipe-Rollway Corp., 806 Emerson Ave., Syra-  
cuse, N. Y.  
Modern Industrial Engrg. Co., 14230 Birwood,  
Detroit 4, Mich.  
Orban, Kurt, Co., Inc., 205 East 42nd St.,  
New York 17, N. Y.  
Sheffield Corp., 721 Springfield, Dayton, Ohio.

**GEAR CHECKING INSTRUMENTS  
AND EQUIPMENT**

Brown & Sharpe Mfg. Co., Providence, R. I.  
Eastman Kodak Co., Rochester, N. Y.  
Fellows Gear Shaper Co., 78 River St., Spring-  
field, Vt.  
Gleason Works, 1000 University Ave., Roches-  
ter 3, N. Y.  
Illinois Tool Works, 2501 North Keeler Ave.,  
Chicago, Ill.  
National Broach & Mch. Co., 5600 St. Jean  
Ave., Detroit 2, Mich.  
Scherr, George, Co., Inc., 200 Lafayette St.,  
New York 12, N. Y.  
Shear-Speed Chem. Prod. Div. Michigan Tool  
Co., 7125 E. McNichols Rd., Detroit 12, Mich.  
Starrett, The L. S. Co., Athol, Mass.  
Taff-Peirce Mfg. Co., Woonsocket, R. I.  
Vincor Corp., 9113 Schaefer Highway, Detroit  
28, Mich.

**GEAR CUTTING MACHINES, Bevel Gears  
(Generators)**

Bigram Gear & Mch. Works, 1217-35 Spring  
Garden St., Philadelphia, Pa.  
Gleason Works, 1000 University Ave., Roches-  
ter 3, N. Y.

**GEAR CUTTING MACHINES  
Bevel Gears, Spiral**

Gleason Works, 1000 University Ave., Roches-  
ter 3, N. Y.

**GEAR CUTTING MACHINES, Spur and  
Bevel Gears (Rotary Cutter)**

Waltham Machine Works, Newton St., Wal-  
tham, Mass.

**GEAR CUTTING MACHINES, Spur and  
Helical Gears (Hobbing)**

Barber-Colman Co., Rock and Montague, Rock-  
ford, Ill.  
Hamilton Tool Co., 834 South 9th St., Hamil-  
ton, Ohio.  
New Jersey Gear & Mfg. Co., 1470 Chestnut  
Ave., Hillside, N. J.  
Orban, Kurt, Co., Inc., 205 East 42nd St., New  
York 17, N. Y.  
Shear-Speed Chem. Prod. Div. Michigan Tool  
Co., 7125 E. McNichols Rd., Detroit 12, Mich.  
Triplex Machine Tool Corp., 75 West St., New  
York 6, N. Y.

**GEAR CUTTING MACHINES, Spur and  
Helical Gears (Shaper or Planer Type)**

Farrel-Birmingham Co., Inc., 25 Main St.,  
Ansonia, Conn.  
Fellows Gear Shaper Co., 78 River St., Spring-  
field, Vt.  
National Tool Co., 11200 Madison Ave., Cleve-  
land, Ohio.  
Shear-Speed Chem. Prod. Div. Michigan Tool  
Co., 7125 E. McNichols Rd., Detroit 12, Mich.

**GEAR CUTTING MACHINES, Worm and  
Worm Wheels**

Barber-Colman Co., Rock and Montague, Rock-  
ford, Ill.  
Fellows Gear Shaper Co., 78 River St., Spring-  
field, Vt. (Straight and Hourglass Types).  
New Jersey Gear & Mfg. Co., 1470 Chestnut  
Ave., Hillside, N. J.  
Shear-Speed Chem. Prod. Div. Michigan Tool  
Co., 7125 E. McNichols Rd., Detroit 12, Mich.

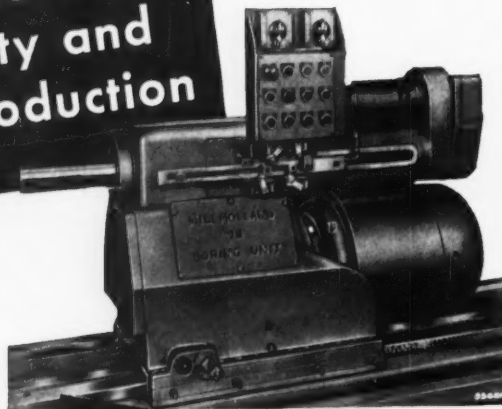
**GEAR FINISHING MACHINES**

Fellows Gear Shaper Co., 78 River St., Spring-  
field, Vt.  
National Broach & Mch. Co., 5600 St. Jean  
Ave., Detroit 2, Mich.  
Shear-Speed Chem. Prod. Div. Michigan Tool  
Co., 7125 E. McNichols Rd., Detroit 12, Mich.

**GEAR GRINDING MACHINES**

Cosa Corp., 405 Lexington Ave., New York 17,  
N. Y.  
Gleason Works, 1000 University Ave., Roches-  
ter 3, N. Y.  
National Broach & Mch. Co., 5600 St. Jean  
Ave., Detroit 2, Mich.  
National Tool Co., 11200 Madison Ave., Cleve-  
land, Ohio.  
Pratt & Whitney, West Hartford 1, Conn.  
Van Norman Co., Springfield, Mass.  
(Continued on page 388)

For Versatility  
Flexibility and  
High Production



Here's a new fixed center  
Horizontal Boring  
Mill unit that quickly  
gives you toolroom accu-  
racy and production  
speeds—plus versatility!

MILLHOLLAND'S  
New AUTOMATIC  
BORING UNIT

Specially designed for short and medium run jobs, a single Millholland Automatic Boring Unit can be used for a variety of jobs, and one or more units can be mounted on a bed to perform a wide range of operations. Automatic operation replaces manual lever shifts, giving a complete automatic feed cycle. Hydraulic feeds are infinitely adjustable.

The body is heavily proportioned throughout for maximum rigidity. The hardened steel alloy spindle reciprocates thru hardened steel bushings mounted in the sleeve. The sleeve is contained in two precision Timken bearings.

**SPECIFICATIONS**

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|--|---------------|-----------------------------|-------|
| Horsepower .....                           | 3 to 10       | Diameter of spindle.....    | 3"    |
| Spindle speeds by pick-<br>off gears ..... | 33 to 500 rpm | Morse taper of spindle..... | No. 5 |
|  |               | Length of stroke .....      | 10"   |

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land Automatic Boring Unit. Let us show you  
how efficiently they can be applied to many of  
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HANNIFIN HYDRAULIC PRESSES  
CAN BE EQUIPPED WITH THE  
CONTROLS YOU NEED

When you select a hydraulic press to do a certain job—it's the control that's all-important. Here Hannifin excels . . . for Hannifin Hydraulic Presses are supplied with many types of control.

One outstanding Hannifin development is patented Sensitive Pressure Control . . . standard equipment on Hannifin straightening and forcing presses. But Hannifin also offers conventional manual control, adjustable for maximum pressure, and a wide range of electric push button controls. Rapid advance followed by slow feed stroke, automatic reversal on time, pre-set pressure, or distance, all are available when needed. Ram speed control can be supplied as an optional extra feature with any of these controls, and cycling can be automatic or semi-automatic.

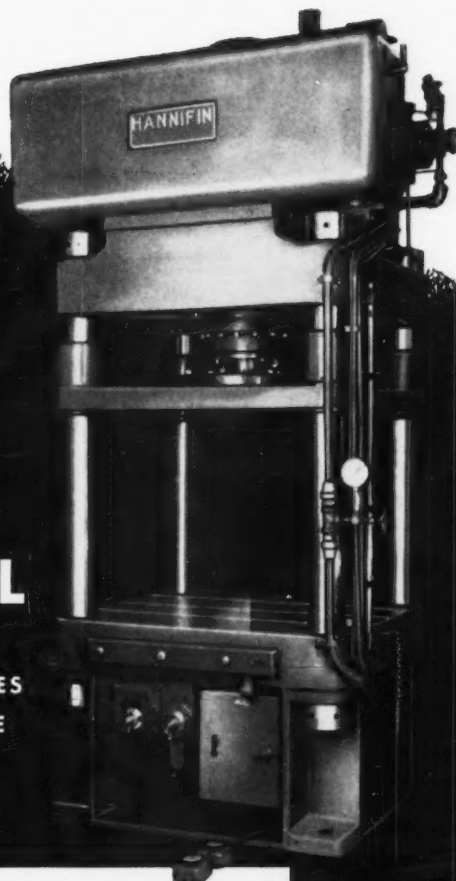
Chances are you can select the right press, and the type of control you need, directly from Hannifin's catalog . . . it lists more than 75 models, capacities from 1 ton to 150 tons. However, if your requirements are special, a Hannifin Field Engineer will analyze them, then recommend the exact control, or combination of controls, to do the job. Why not consult with him? Hannifin Corporation, 1109 S. Kilbourn Ave., Chicago 24, Ill.

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# HANNIFIN

Hydraulic Presses • Pneumatic Presses • Hydraulic Riveters  
Hydraulic Cylinders • Air Cylinders • Air Control Valves



**150-TON FOUR-COLUMN PRESS**—Semi-automatic cycle. Advance at high speed, feed stroke starting at pre-set point in stroke and automatic reversal. Self-contained unit with reservoir, hydraulic pumps and control valves on top of press. Dual electric push buttons.

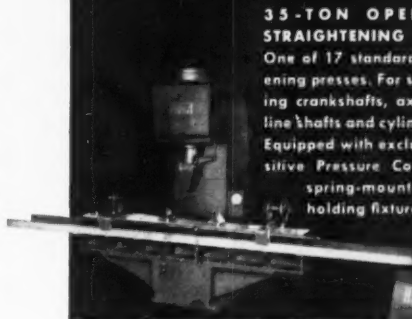
**15-TON FORCING PRESS**—With built-in hydraulic power unit and exclusive, patented Sensitive Pressure Control. Gap, 22" ; stroke, 21" ; reach, 10" ; table, 19" x 22" with U slot.



**HANNIFIN'S NEW HYDRAULIC "HAN-D-PRESS"**—For small part assembly operations. Available in 1-ton and 2-ton sizes with pressure adjustable. Stroke, 6" ; reach, 6" ; gap, 10" . Speeds: (1 ton) 400 ipm, advance; 800 ipm, return. Dual manual controls standard.



**35-TON OPEN GAP STRAIGHTENING PRESS**—One of 17 standard straightening presses. For straightening crankshafts, axle shafts, line shafts and cylinder stock. Equipped with exclusive Sensitive Pressure Control and spring-mounted, work-holding fixture on 160" rails.



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Title.....  
Company.....  
Address.....  
City.....State.....

**GEAR HARDENING MACHINES**

Gleason Works, 1000 University Ave., Rochester 3, N. Y.

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Gleason Works, 1000 University Ave., Rochester 3, N. Y.  
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.  
Shear-Speed Chem. Prod. Div. Michigan Tool Co., 7125 E. McNichols Rd., Detroit 12, Mich.

**GEAR MOTORS**

See Speed Reducers.

**GEAR SHAVING MACHINES**

Fellows Gear Shaper Co., 78 River St., Springfield, Vt.  
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.

Shear-Speed Chem. Prod. Div. Michigan Tool Co., 7125 E. McNichols Rd., Detroit 12, Mich.

**GEAR TESTING MACHINERY**

Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.  
Brown & Sharpe Mfg. Co., Providence, R. I.  
Eastman Kodak Co., Rochester, N. Y.  
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.  
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.  
Gleason Works, 1000 University Ave., Rochester 3, N. Y.  
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.  
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.  
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

**GEARS, Cut**

American Stock Gear Div., Perfection Gear Co., Harvey, Ill.

Amgears, Inc., 6633 W. 65th St., Chicago 38, Ill.  
Atlantic Gear Works Inc., 200 Lafayette St., New York 12, N. Y.  
Automotive Gear Works, Inc., Richmond, Ind.  
Baugh Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.  
Bilgram Gear & Mch. Works, 1217-35 Spring Garden St., Philadelphia, Pa.  
Boston Gear Works, 3200 Main St., North Quincy, Mass.  
Brad Foote Gear Works, 1309 S. Cicero Ave., Cicero 50, Ill.  
Braun Gear Co., 239 Richmond, Brooklyn 8, N. Y.  
Cincinnati Gear Co., Wooster Pike and Mariemont Ave., Cincinnati, Ohio.  
Cleveland Warm & Gear Co., 3249 E. 80th St., Cleveland, Ohio.  
Cone-Drive Gears Div., Michigan Tool Co., 7200 E. McNichols Rd., Detroit, Mich.  
Diefendorf Gear Corp., 920 N. Belden Ave., Syracuse, N. Y.  
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.  
Franke Gear Works, Inc., 1924 W. Columbia Ave., Chicago 26, Ill.  
Gear Specialties Inc., 2635 W. Medill Ave., Chicago 47, Ill.  
Gleason Works, 1000 University Ave., Rochester 3, N. Y.  
Greaves Mch. Tool Co., 2009 Eastern Ave., Cincinnati, Ohio.  
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.  
Illinois Gear & Mch. Co., 2120 No. Natchez Ave., Chicago 35, Ill.  
Mass. Gear & Tool Co., 36 Nassau St., Woburn, Mass.  
New Jersey Gear & Mfg. Co., 1470 Chestnut Ave., Hillside, N. J.  
Ohio Gear Co., 1333 E. 179th St., Cleveland.  
Perkins Mch. & Gear Co., Box 1611, Springfield 2, Mass.  
Philadelphia Gear Works, Erie Ave. and G St., Philadelphia, Pa.  
Shear-Speed Chem. Prod. Div. Michigan Tool Co., 7125 E. McNichols Rd., Detroit 12.  
Sier-Bath Gear & Pump Co., Inc., 9248 Hudson Blvd., North Bergen, N. J.  
Stahl Gear & Mch. Co., 3901 Hamilton Ave., Cleveland 14, Ohio.  
Westinghouse Electric Corp., Pittsburgh 30, Pa.  
Williamson Gear & Machine Co., 2606 Martha St., Philadelphia 25, Pa.

**GEARS, Rawhide and Non-Metallic**

American Stock Gear Div., Perfection Gear Co., Harvey, Ill.  
Amgears, Inc., 6633 W. 65th St., Chicago 38.  
Atlantic Gear Works, Inc., 200 Lafayette St., New York 12, N. Y.  
Boston Gear Works, 3200 Main St., North Quincy, Mass.  
Braun Gear Co., 239 Richmond, Brooklyn 8, N. Y.  
Cincinnati Gear Co., Wooster Pike and Mariemont Ave., Cincinnati, Ohio.  
Diefendorf Gear Corp., 920 N. Belden Ave., Syracuse, N. Y.  
Gear Specialties, Inc., 2635 W. Medill Ave., Chicago 47, Ill.  
Greaves Mch. Tool Co., 2009 Eastern Ave., Cincinnati, Ohio.  
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.  
James, D. O., Gear Mfg. Co., 1140 W. Monroe St., Chicago 7, Ill.  
Ohio Gear Co., 1333 E. 179th St., Cleveland.  
Philadelphia Gear Works, Erie Ave. and G St., Philadelphia, Pa.  
Stahl Gear & Mch. Co., 3901 Hamilton Ave., Cleveland 14, Ohio.  
Westinghouse Electric Corp., Pittsburgh 30, Pa.  
Williamson Gear & Machine Co., 2606 Martha St., Philadelphia 25, Pa.

**GENERATORS, Electric**

General Electric Co., Schenectady 5, N. Y.  
Lincoln Electric Co. (Arc), 22801 St. Clair Ave., Cleveland, Ohio.  
Reliance Electric & Engrg. Co., 1074 Ivanhoe Rd., Cleveland 10, Ohio.  
Westinghouse Electric Corp., Pittsburgh 30, Pa.

**GRADUATING MACHINES**

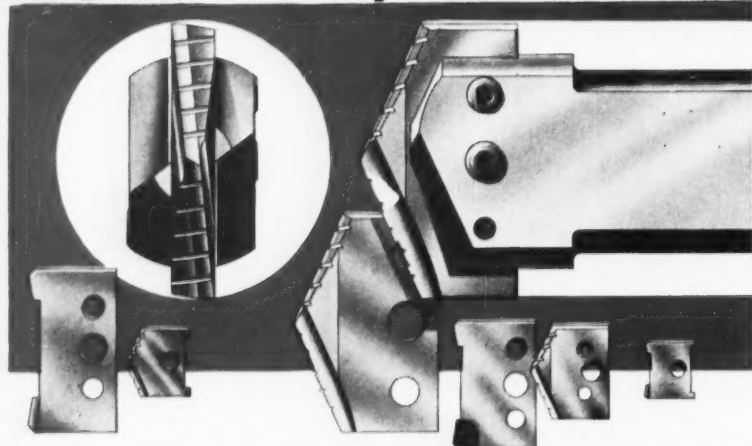
Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.  
Gorton Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.  
Greaves Mch. Tool Co., 2009 Eastern Ave., Cincinnati, Ohio.

**GREASE**

Cities Service Oil Co., 70 Pine St., New York, N. Y.  
Gulf Oil Corp., Gulf Bldg., Pittsburgh 30, Pa.  
Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa.  
Lubriplate Div., Fiske Bros. Refining Co., 129 Lockwood St., Newark 5, N. J.

(Continued on page 390)

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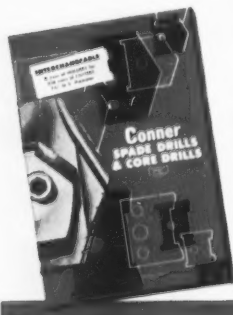
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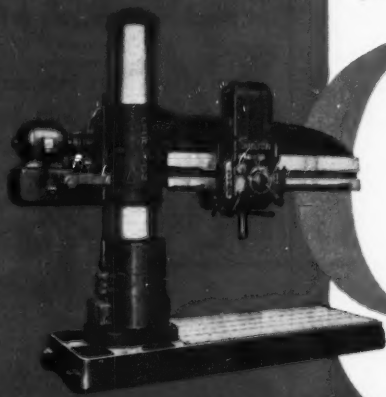
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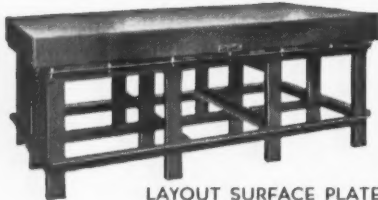
**Carlton**  
radial drills



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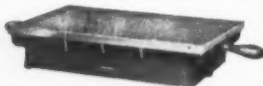
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Tide Water Associated Oil Co., 17 Battery Place, New York, N. Y.

### GRINDERS, Carbide Tool

See Grinding Mches, Carbide Tool

### GRINDERS, Centerless

Van Norman Co., Springfield, Mass.

### GRINDERS, Die and Mold

Consolidated Mch. Tool Corp., Rochester, N. Y.  
Dumore Co., 1300 17th St., Racine, Wis.  
Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich.  
Pratt & Whitney, West Hartford 1, Conn.  
Precise Products Corp., 1328-30 Clark St., Racine, Wis.  
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.  
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.  
Thor Power Tool Co., Aurora, Ill.

### GRINDERS, Oilstone, for Woodworking Tools

Mummert-Dixon Co., Hanover, Pa.

### GRINDERS, Pneumatic

Air Conversion Research Corp., 4107 N. Damen Ave., Chicago 18, Ill.  
Bellows Co., 230 W. Market St., Akron, Ohio.  
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.  
Cleco Div., Reed Roller Bit Co., 5125 Clinton Ave., Houston 20, Texas.  
Ingersoll-Rand Co., Phillipsburg, N. J.  
Keller Tool Co., Grand Haven, Conn.  
Madison-Kipp Corp., Madison, Wis.  
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.  
Thor Power Tool Co., Aurora, Ill.

### GRINDERS, Portable Electric and Toolpost

Black & Decker Mfg. Co., E. Penna. Ave., Towson, Md.  
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.  
Dumore Co., 1300 17th St., Racine, Wis.  
Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich.  
Millers Falls Co., Greenfield, Mass.  
Precise Products Corp., 1328-30 Clark St., Racine, Wis.  
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.  
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.  
Thor Power Tool Co., Aurora, Ill.  
United States Electrical Tool Div., Emerson Elec. Mfg. Co., 1050 Findlay St., Cincinnati 14, Ohio.

### GRINDING FIXTURES

Geometric Tool Co. (Die Chaser), Westville Station, New Haven 15, Conn.  
Precise Products Corp., 1328-30 Clark St., Racine, Wis.  
Taft-Peirce Mfg. Co., Woonsocket, R. I.

### GRINDING MACHINES, Abrasive Belt

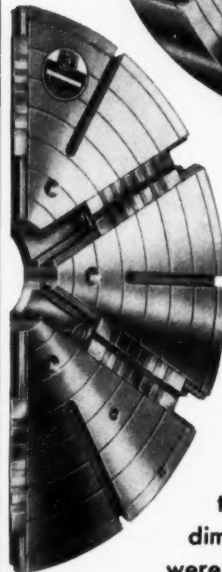
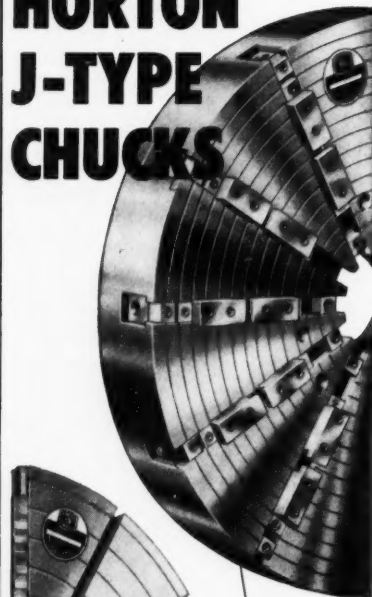
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.  
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.  
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.  
Mattison Mch. Works, Rockford, Ill.  
Mead Specialties Co., 4114 North Knox Ave., Chicago 41, Ill.  
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.  
Walker-Turner Div., Kearney & Trecker Corp., 900 North Ave., Plainfield, N. J.  
Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

### GRINDING MACHINES, Bench

Besly-Welles Corp., Beloit, Wis.  
Black & Decker Mfg. Co., E. Penna. Ave., Towson, Md.  
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.  
Gorton, George, Mch. Co., 1110 W. 13th St., Racine, Wis.  
Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich.  
Hardinge Bros., Inc., 1418 College Ave., Elmira, N. Y.  
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(Continued on page 392)

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Pioneered by Horton these large dimension chucks were designed for the aircraft industry especially for machining various jet engine parts.

For 102 years Horton Chucks have kept pace with industry's demands.

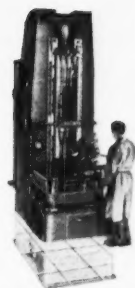


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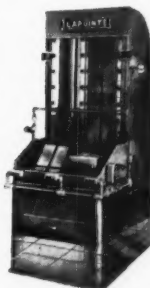
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**SRV**



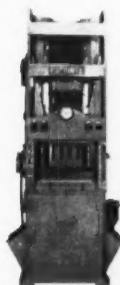
3 to 25 ton, 30" to 90" stroke

**DRV**



3 to 25 ton, 30" to 90" stroke

**VPU**



10 to 25 ton, 36" to 60" stroke

**VPD**



5 to 50 ton, 36" to 60" stroke

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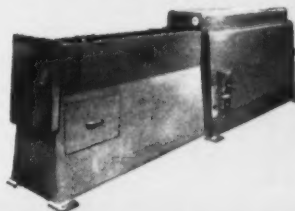
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**BROACHING MACHINE  
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Here are a few machines representing basic designs. They embody engineering skill and broaching experience extending back over fifty years — a wealth of experience exceeding that of every other broaching machine manufacturer.

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**HP**

2½ to 50 ton, 30" to 78" stroke



...and here's the latest LAPORTE machine:

**SRHE** Capable of broaching speeds up to 300 fpm and more! Strokes 90" up to 180".



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 United States Electrical Tool Div., Emerson Elec. Mfg. Co., 1050 Findlay St., Cincinnati 14, Ohio.  
 Walker-Turner Div., Kearney & Trecker Corp., 900 North Ave., Plainfield, N. J.

#### GRINDING MACHINES, Broach

Colonial Broach Co., Detroit 13, Mich.  
 Lapointe Mch. Tool Co., 34 Tower St., Hudson, Mass.

#### GRINDING MACHINES, Camshaft

Landis Tool Co., Waynesboro, Pa.  
 Norton Co., 1 New Bond St., Worcester 6, Mass.

#### GRINDING MACHINES, Carbide Tool

Arter Grinding Mch. Co., 15 Sagamore Rd., Worcester 5, Mass.  
 Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.

Cosa Corp., 405 Lexington Ave., New York 17, N. Y.  
 Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.  
 Do All Co., 254 N. Laurel Ave., Des Plaines, Ill.  
 Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.  
 Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich.  
 Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.  
 Orban, Kurt Co., Inc., 205 East 42nd St., New York 17, N. Y.  
 Sheffield Corp., 721 Springfield, Dayton, Ohio.  
 Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.  
 Triplex Machine Tool Corp., 75 West St., New York 6, N. Y.  
 Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

#### GRINDING MACHINES, Centerless

Cincinnati Grinders, Inc., Cincinnati, Ohio.  
 Heald Machine Co., 10 New Bond St., Worcester 6, Mass.  
 Landis Tool Co., Waynesboro, Pa.  
 Triplex Machine Tool Corp., 75 West St., New York 6, N. Y.

#### GRINDING MACHINES, Chucking

Bryant Chucking Grinder Co., 257 Clinton St., Springfield, Vt.  
 Bullard Co., Brewster St., Bridgeport, Conn.  
 Landis Tool Co., Waynesboro, Pa.

#### GRINDING MACHINES, Crankshaft

Landis Tool Co., Waynesboro, Pa.  
 Norton Co., 1 New Bond St., Worcester 6, Mass.

#### GRINDING MACHINES, Cylindrical

Arter Grinding Mch. Co., 15 Sagamore Rd., Worcester 5, Mass.  
 Brown & Sharpe Mfg. Co., Providence, R. I.  
 Cincinnati Grinders, Inc., Cincinnati, Ohio.  
 Cosa Corp., 405 Lexington Ave., New York 17, N. Y.  
 DoAll Co., 254 Laurel Ave., Des Plaines, Ill.  
 Dumore Co., 1300 17th St., Racine, Wis.  
 Frauenthal Div., Kaydon Engineering Corp., Muskegon, Mich.  
 Landis Tool Co., Inc., Waynesboro, Pa.  
 Norton Co., 1 New Bond St., Worcester 6, Mass.  
 Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.  
 Sheffield Corp., 721 Springfield, Dayton, Ohio.  
 Van Norman Co., 2640 Main St., Springfield 7, Mass.

#### GRINDER MACHINES, Die Chaser

Eastern Mch. Screw Corp., New Haven, Conn.  
 Landis Machine Co., Waynesboro, Pa.

#### GRINDING MACHINES, Disc

Besly-Welles Corp., Beloit, Wis.  
 Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.  
 Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich.  
 Mattison Machine Works, Rockford, Ill.  
 Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.  
 United States Electrical Tool Div., Emerson Elec. Mfg. Co., 1050 Findlay St., Cincinnati 14, Ohio.

#### GRINDING MACHINES, Drill

Blake, Edward Co., 442 Cherry St., West Newton 65, Mass.  
 Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.  
 Galmeyer & Livingston Co., 336 Straight Ave., S. W. Grand Rapids 4, Mich.  
 Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich.  
 Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa.  
 Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.  
 Orban, Kurt Co., Inc., 205 East 42nd St., New York 17, N. Y.  
 Union Twist Drill Co., Athol, Mass.

#### GRINDING MACHINES, Face

Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.  
 Besly-Welles Corp., Beloit, Wis.  
 Columbia Machinery & Engrg. Corp., Hamilton 1, Ohio.  
 Cosa Corp., 405 Lexington Ave., New York 17, N. Y.  
 Mattison Machine Works, Rockford, Ill.  
 Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.  
 Orban, Kurt Co., Inc., 205 East 42nd St., New York 17, N. Y.

#### GRINDING MACHINES, Flexible Shaft

See Flexible Shaft Equipment.

#### GRINDING MACHINES, Gap

Cincinnati Grinders, Inc., Cincinnati, Ohio.  
 Landis Tool Co., Waynesboro, Pa.

#### GRINDING MACHINES, Gear Tooth

See Gear Grinding Machines

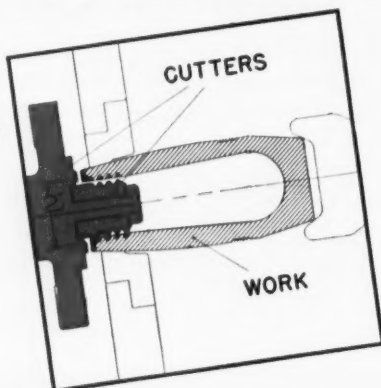
#### GRINDING MACHINES, For Sharpening Cutters, Reamers, Hobs, Etc.

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 Cosa Corp., 405 Lexington Ave., New York 17, N. Y.  
 Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.  
 Fellows Gear Shaper Co., 78 River St., Springfield, Vt.  
 Galmeyer & Livingston Co., 336 Straight Ave., S. W. Grand Rapids 4, Mich.  
 Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.  
 Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.  
 Landis Tool Co., Waynesboro, Pa.

(Continued on page 396)

another job for the **HALL PLANETARY!**

... proving that accuracy cannot be replaced by anything!



This job—simultaneously facing and threading an ammunition part—aptly demonstrates the unique advantages of the Hall Planetary.

The only other way to do this job would be to perform separate tapping and facing operations. By milling and facing simultaneously on the Hall Planetary, the following advantages are secured: **CONCENTRICITY** between thread and locating surfaces, **TRUE FORM** of thread, good **FINISH** obtained by milling, **ACCURACY** of lead along

complete surface of thread, **ALIGNMENT** with chucking surfaces, **SQUARENESS** with face.

Rotating eccentric containers in the Hall Planetary produce the exclusive planetary movement. The spindle on which the cutters are mounted rotates within these eccentrics and moves in a circular arc from the center, entering the work near the extreme of the eccentric. The cutters then move around the circumference of the work, completing the cuts and automatically returning to center in one cycle.

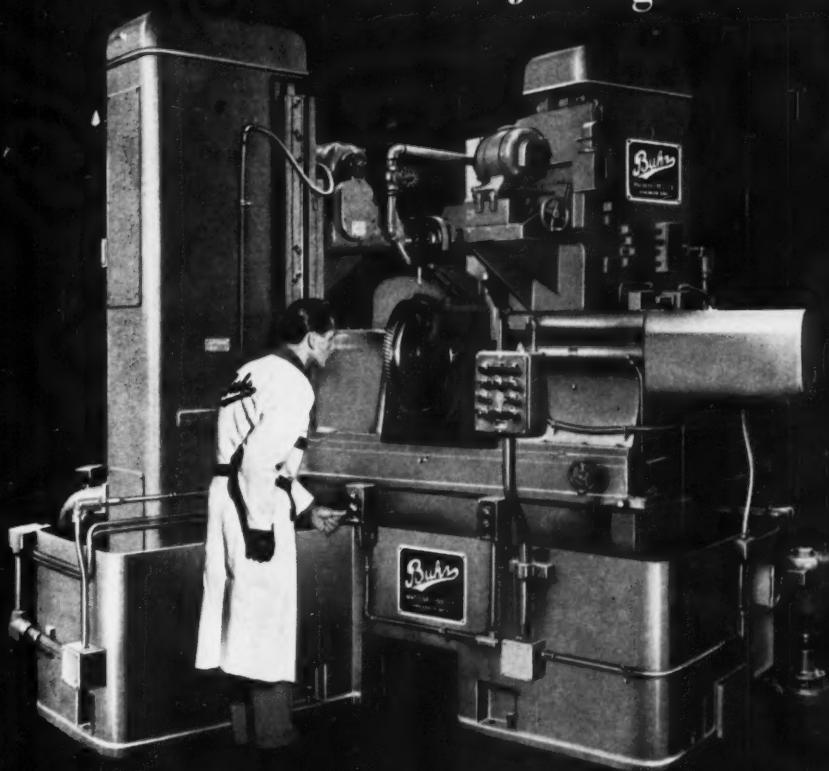
Remember—accuracy cannot be replaced by anything. Combined operations on the Hall Planetary assure highest accuracy, and at the same time increase output.



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## SPECIAL...

Mills both ends of 57 up to 103 slots in 16  
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Automatic 2-spindle milling machine, arranged with automatic index for milling both ends of dove-tailed slots.

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Hydraulic and electrical installations to J.I.C. standards.

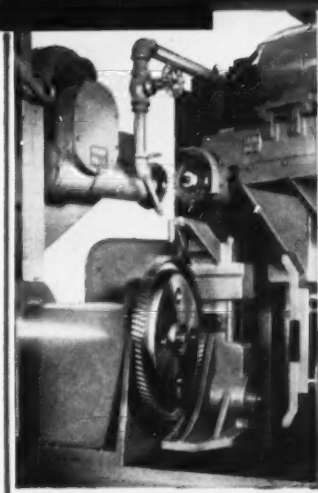
Automatic index unit arranged for milling the various stages from 57 up to 103 slots.

Once machine is set up for any one part, operation is fully automatic, including stop when part is finished.

**BUHR MACHINE TOOL CO.**  
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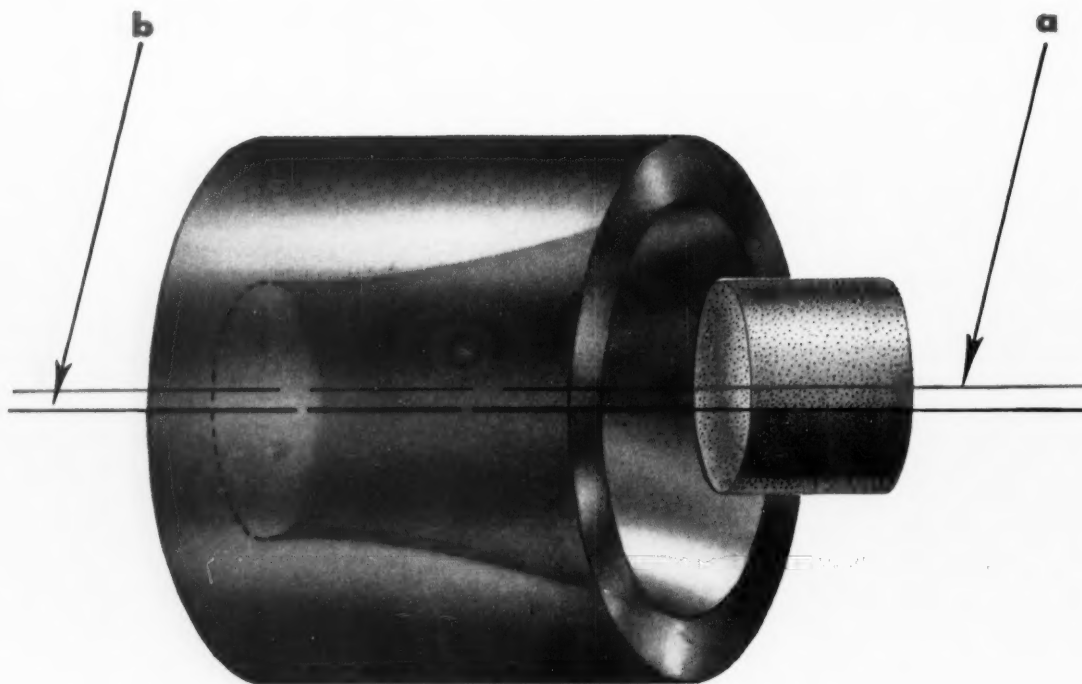
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HIGH PRODUCTION MACHINERY**





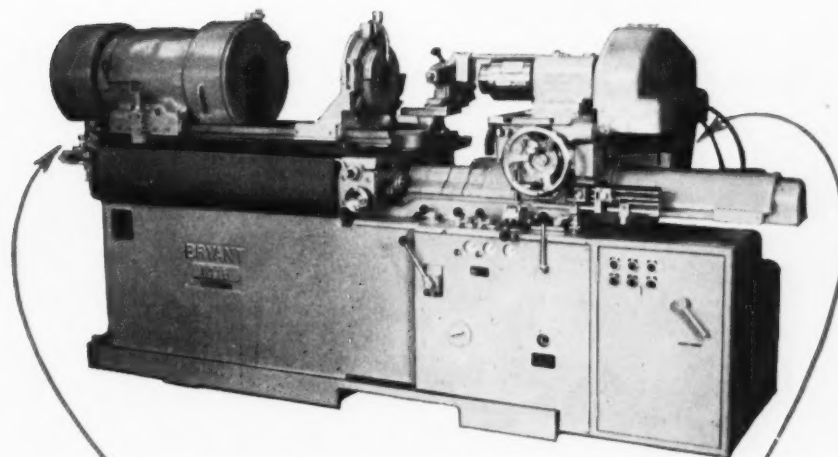
# alignment

## for better internal grinding



**T**O GRIND a taper, the internal grinder must be set up according to simple geometric principles; that is, the path of the grinding wheel must be a straight line and must intersect the axis of the workpiece at a point. In the illustration, the axis of the wheel path "a" and the axis of the work "b" lie in parallel planes. The axes cross, but fail to intersect. Under these conditions, it is impossible to grind a true taper. As the grinding wheel enters the large end of the taper, the point of contact is high. This end of the taper can be ground to size. As the wheel progresses through the hole, the contact moves even higher, with the result that the hole will be progressively oversize and a curve is generated instead of a uniform taper.

A taper ground under these conditions probably will blue only in the middle. Turning the workhead may shift this plug contact but, as the wheel wears, the plug contact will continue to move. The remedy is to correct alignment so the wheel path and wheel axis "a" and the work axis "b" intersect and lie in a plane which includes the diamond. Then a uniform taper will be generated. In shop practice the adjustment would be made by bringing the wheel and work to exactly the same center height.



Left end of workhead may be raised or lowered to bring its axis into a plane parallel with wheelslide bar.

Rear of wheelslide may be adjusted to insure straight line motion of the wheel.

**T**his semi-automatic machine is for grinding bores in long parts and is adaptable for either production or tool room work. It will swing work up to 16" and grind bores up to 9" depth. The work is held in a standard hollow work spindle and steadyrest. The workhead may be adjusted longitudinally over a distance of 37" to meet the requirements of a large variety of work. It may be pivoted for grinding a taper up to 30° included angle. Hydraulic operation provides a wide range of traverse speeds. Write for folder.

**Bryant Chucking Grinder Company**  
Springfield, Vermont, U. S. A.

*Internal grinders • Internal & External thread gages*

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 Norton Co., 1 New Bond St., Worcester 6, Mass.  
 Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.  
 Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.  
 Pratt & Whitney, West Hartford 1, Conn.  
 Precise Products Corp., 1328-30 Clark St., Racine, Wis.  
 Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.  
 Thompson Grinder Co., 1500 W. Main St., Springfield, Ohio.  
 Union Twist Drill Co., Athol, Mass.

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 Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.  
 Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich.

Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.  
 Orban, Kurt Co., Inc., 205 East 42nd St., New York 17, N. Y.  
 South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.  
 Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.  
 Walker, O. S. Co., Inc., Worcester, Mass.  
 Waltham Machine Works, Newton St., Waltham, Mass.

#### GRINDING MACHINES, Internal

Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.  
 Arter Grinding Mch. Co., 15 Sagamore Rd., Worcester 5, Mass.  
 Bryant Chucking Grinder Co., 257 Clinton St., Springfield, Vt.  
 Cosa Corp., 405 Lexington Ave., New York 17, N. Y.  
 Dumore Co., 1300 17th St., Racine, Wis.  
 Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.

Frauenthal Div., Kaydon Engineering Corp., Muskegon, Mich.  
 Heald Machine Co., 10 New Bond St., Worcester 6, Mass.  
 Orban, Kurt Co., Inc., 205 East 42nd St., New York 17, N. Y.  
 Precise Products Corp., 1328-30 Clark St., Racine, Wis.  
 Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.  
 Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.  
 Wicaco Machine Corp., Stenton Ave. and Louden St., Philadelphia, Pa.

#### GRINDING MACHINES, Jig

Moore Special Tool Co., Inc., 724 Union Ave., Bridgeport, Conn.  
 Pratt & Whitney, West Hartford 1, Conn.

#### GRINDING MACHINES, Knife and Shear Blade

Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.  
 Columbia Machinery & Engrg. Corp., Hamilton 1, Ohio.  
 Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.  
 Mattison Machine Works, Rockford, Ill.  
 United States Electrical Tool Div., Emerson Elec. Mfg. Co., 1050 Findlay St., Cincinnati 14, Ohio.

#### GRINDING MACHINES, Piston Ring

Besly-Welles Corp., Beloit, Wis.  
 Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.  
 Heald Machine Co., 10 New Bond St., Worcester 6, Mass.  
 Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo.  
 Mattison Machine Works, Rockford, Ill.  
 Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.

#### GRINDING MACHINES, Profile

Cleveland Grinding Machine Co., 1643 Eddy Rd., Cleveland 12, Ohio.  
 Cosa Corp., 405 Lexington Ave., New York 17, N. Y.  
 Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.  
 Orban, Kurt Co., Inc., 205 East 42nd St., New York 17, N. Y.  
 Sheffield Corp., 721 Springfield, Dayton, Ohio.

#### GRINDING MACHINES, Radial, Ball Race, Etc.

Besly-Welles Corp., Beloit, Wis.  
 Frauenthal Div., Kaydon Engineering Corp., Muskegon, Mich.  
 Landis Tool Co., Waynesboro, Pa.  
 Van Norman Co., Springfield, Mass.

#### GRINDING MACHINES, Radius, Link

Consolidated Mch. Tool Corp., Rochester, N. Y.  
 Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

#### GRINDING MACHINES, Ring Wheel

Besly-Welles Corp., Beloit, Wis.  
 Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.  
 Mattison Machine Works, Rockford, Ill.  
 Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.

#### GRINDING MACHINES, Roll

Farrel-Birmingham Co., 25 Main St., Ansonia, Conn.  
 Landis Tool Co., Waynesboro, Pa.  
 Norton Co., 1 New Bond St., Worcester 6, Mass.

#### GRINDING MACHINES, Spline Shaft

Van Norman Co., Springfield, Mass.

#### GRINDING MACHINES, Surface

Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.  
 Arter Grinding Mch. Co., 15 Sagamore Rd., Worcester 5, Mass. (Rotary)  
 Besly-Welles Corp., Beloit, Wis.  
 Blanchard Machine Co., 64 State St., Cambridge, Mass.  
 Brown & Sharpe Mfg. Co., Providence, R. I.  
 Columbia Machinery & Engrg. Corp., Hamilton 1, Ohio.  
 Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.  
 DoAll Co., 254 Laurel Ave., Des Plaines, Ill.  
 Frauenthal Div., Kaydon Engineering Corp., Muskegon, Mich.  
 Gollmeyer & Livingston Co., 336 Straight Ave., S. W., Grand Rapids 4, Mich.  
 Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.  
 Heald Machine Co., 10 New Bond St., Worcester 6, Mass.  
 Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.

(Continued on page 398)

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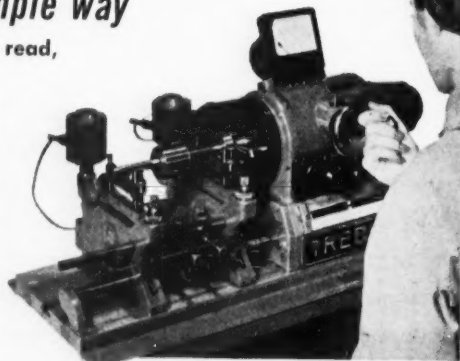
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 Accurate within .000325" displacement of center of gravity  
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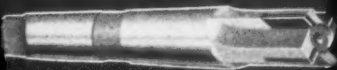
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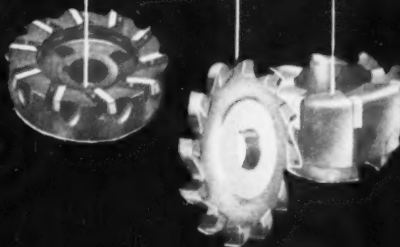
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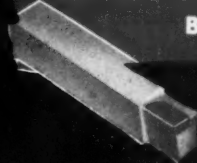
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Sheffield Corp., 721 Springfield, Dayton, Ohio.  
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Thompson Grinder Co., 1500 W. Main St., Springfield, Ohio.  
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Walker, O. S., Co., Inc., Worcester, Mass.

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Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.

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Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.  
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Landis Tool Co. (Centerless), Waynesboro, Pa.  
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Ingersoll-Rand Co., Phillipsburg, N. J.  
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(Continued on page 400)

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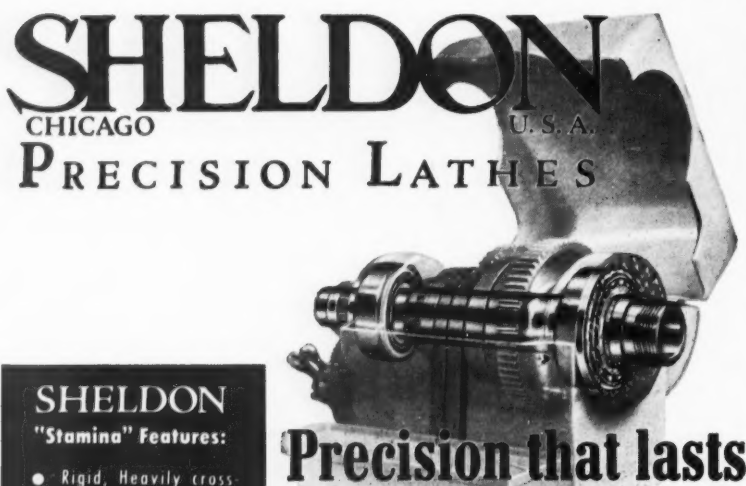
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(Continued on page 402)

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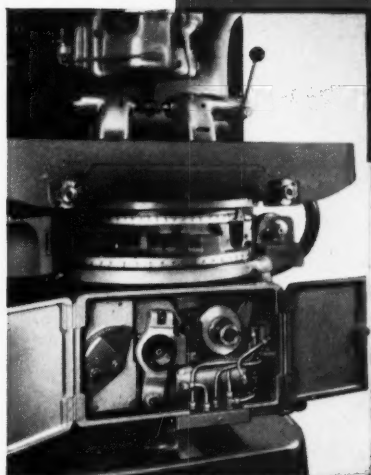
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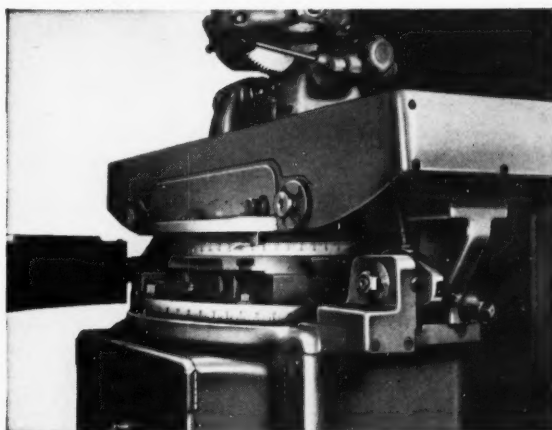
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 Morgan Engrg. Co., Alliance, Ohio.  
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 Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.  
 Ingersoll Milling Machine Co., 2442 Douglas St., Rockford, Ill.  
 Jahn, B., Manufacturing Co., Ellis St., New Britain, Conn.  
 Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.  
 Northwestern Tool & Engrg. Co., 117 Hollier, Dayton, Ohio.  
 Sheffield Corp., 721 Springfield, Dayton, Ohio.  
 Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.  
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 Taft-Peirce Mfg. Co., Woonsocket, R. I.  
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 Mitfs & Merrill, 68 Holden St., Saginaw, Mich.

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(Continued on page 404)

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# 500

## PIECES PER HOUR!

High-production and economical operation are the features of the WICACO CONTINUOUS OIL GROOVER . . . capable of completing as many as 500 grooved pieces per hour in routine practice—even with unskilled labor!

The operator loads and unloads the work **without stopping the Machine**—a valuable time-saving advantage made possible by the WICACO upright construction of the spindle and stationary chuck. Feed-lever automatically returns to neutral position when cutting tool reaches its proper depth. The spindle—not the chuck—revolves, permitting fast and convenient grooving of a variety of larger and irregular work. Maximum depth of groove 7/32", maximum width 3/8", grooves may be cut in work from 1/4" I.D. to 4 1/2" I.D.; standard chuck holds work to 4 1/2" O.D.; stroke of spindle from 0" to 7"; floor space 24" dia.; weight of machine about 950 lbs.

Send us sample bearings to cut to specifications. We will return them, properly grooved, with a record of the time required and a cost estimate. No obligation. Or, write for detailed, well-illustrated Bulletin.



# WICACO

SINCE 1868

THE WICACO MACHINE CORPORATION

WAYNE JUNCTION

PHILADELPHIA 44, PA.

# PARTS LIKE THESE



**are produced better . . . at lower cost  
by ALLIED'S COLD FORGING METHODS**

Shown at the right in actual size is one of the many cold forged parts being produced by Allied.

By no other method could this particular part, or any of the other parts illustrated above, be manufactured as economically as by cold forging. However, to produce such parts requires ingenious engineering and production methods . . . and it is at Allied where

you will find the best examples of cold forging ingenuity at work.

If you have need for parts similar to these . . . if you require tolerances as close as may be required for most machined parts . . . if you want maximum strength and durability in the parts produced . . . it will pay you to investigate what Allied can do for you. Send your part prints for quotation.

## *Other Allied Products*

**HARDENED AND PRECISION GROUND PARTS  
SHEET METAL DIES PRODUCED IN IRON,  
ALLITE (ZINC ALLOY) AND PLASTIC • R-B  
INTERCHANGEABLE PUNCHES AND DIES**

### **STANDARD HEXAGON HEAD CAP SCREWS**

Also produced by Allied are standard hexagon head cap screws. They are of uniformly high quality and are priced competitively. Your inquiry will receive prompt attention.



## **ALLIED PRODUCTS CORPORATION**

DEPT. D-13 • 12619 BURT ROAD • DETROIT 23, MICH.



**PLANT 1**  
Detroit, Mich.



**PLANT 2**  
Detroit, Mich.



**PLANT 3**  
Hillsdale, Mich.



**PLANT 4**  
Hillsdale, Mich.

For more information on products advertised, use Inquiry Card, page 239

MACHINERY, September, 1953—403

Fellows Gear Shaper Co., 78 River St., Springfield, Vt.  
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.  
Micromatic Hone Corp., 8100 Schoolcraft, Detroit 4, Mich.  
Norton Co., 1 New Bond St., Worcester 6, Mass.  
Taft-Peirce Mfg. Co., Woonsocket, R. I.

#### LAPPING PLATES, Hand

Crane Packing Co., 1800 Cuyler Ave., Chicago, Ill.

#### LATHE AND GRINDING DOGS

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.

#### LATHE ATTACHMENTS

American Tool Works Co., Pearl and Eggleston Aves., Cincinnati, Ohio.  
Cincinnati Lathe & Tool Co., 3207-3211 Disney St., Oakley, Cincinnati 9, Ohio.

Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.  
Hendey Machine Co., Inc., Torrington, Conn.  
Jones & Lamson Mch. 160 Clinton St., Springfield, Vt.  
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.  
Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa.  
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.  
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.  
Monarch Machine Tool Co., 27 Oak St., Sidney, Ohio.  
Pratt & Whitney, West Hartford 1, Conn.  
Precise Products Corp., 1328-30 Clark St., Racine, Wis.  
Reed-Prentice Corp., 677 Cambridge St., Worcester, Mass.  
Reed Rolled Thread Die Co., P. O. Box 350, Worcester 1, Mass.  
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.  
Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill.

Seneca Falls Mch. Co., Seneca Falls, N. Y.  
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.  
Sidney Machine Tool Co., Sidney, Ohio.  
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.  
Springfield Mch. Tool Co., Springfield, Ohio.  
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.  
Turchan Follower Mch. Co., 8259 Livernois & Alaska Aves., Detroit, Mich.  
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

#### LATHE CONVERTER

Master Mfg. Co., Hutchinson, Kansas.

#### LATHES, Automatic

Bullard Co., Brewster St., Bridgeport 2, Conn.  
Cone Automatic Mch. Co., Inc., Windsor, Vt.  
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.  
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.  
Goss & DeLeeuw Mch. Co., Kensington, Conn.  
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.  
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.  
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.  
Monarch Machine Tool Co., 27 Oak St., Sidney, Ohio.  
National Acme Co., 170 E. 131st St., Cleveland, Ohio.  
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.  
Porter-Cable Machine Co., Salina St., Syracuse, N. Y.  
Potter & Johnston Co., 1027 Newport Ave., Pawtucket, R. I.  
Pratt & Whitney, West Hartford 1, Conn.  
Russell, Holbrook & Henderson, Inc., 292 Madison Ave., New York 17, N. Y.  
Seneca Falls Mch. Co., Seneca Falls, N. Y.  
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.  
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

#### LATHES, Axle

Consolidated Mch. Tool Corp., Rochester, N. Y.  
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.  
Seneca Falls Mch. Co., Seneca Falls, N. Y.  
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.  
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

#### LATHES, Bench

Cosa Corp., 405 Lexington Ave., New York 17, N. Y.  
Hardinge Bros., Inc., 1418 Coliege Ave., Elmira, N. Y.  
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.  
Pratt & Whitney, West Hartford 1, Conn.  
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.  
Seneca Falls Mch. Co., Seneca Falls, N. Y.  
Sheldon Mch. Co., Inc., 4240-4258 N. Knox Ave., Chicago 41, Ill.  
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.

#### LATHES, Boring

Bullard Co., Brewster St., Bridgeport 2, Conn.  
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.  
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.  
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.  
Sidney Machine Tool Co., Sidney, Ohio.

#### LATHES, Crankshaft

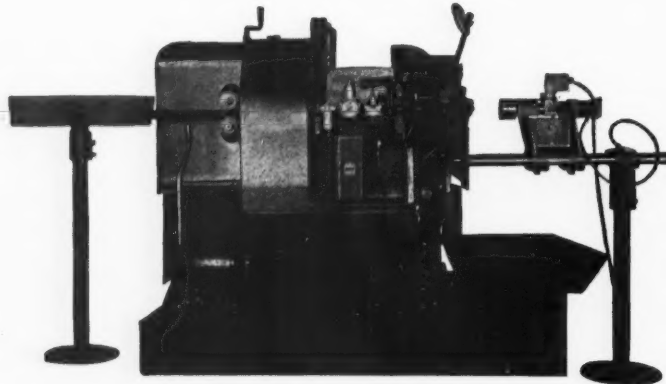
Consolidated Mch. Tool Corp., Rochester, N. Y.  
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.  
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.  
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

#### LATHES, Double-End

Consolidated Mch. Tool Corp., Rochester, N. Y.  
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.  
Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo.  
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.  
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

(Continued on page 406)

## The NEW MODERN AUTOMATIC CUTTING-OFF MACHINE



### Cuts Off Tubing, Pipe and Shafting . . . FAST

Cuts off longer pieces than a regular automatic machine. In fact, cuts off *any length you want*—and cuts it *faster*. If your production *requires* quantity cutting-off of tubing, pipe or shafting, check the figures below against your present time.

#### 1/2" Tubing

This machine cuts off and chamfers both outside edges of 1/2" .030 wall tubing, 5" long, at the rate of one every 2.5 seconds.

#### 1 1/4" Cold Rolled

This machine cuts off and chamfers both ends of 1 1/4" cold rolled, 20" long, at the rate of one every 20 seconds.

#### 1" Tubing

This machine cuts off and chamfers both outside edges of 3" long, at the rate of one every 3 seconds.

#### 4" Threaded Studs



Cut and chamfered at one time—in 8 seconds—from 10 ft. length of stock already threaded. (3/4" U. S. Standard.) Clean cut. Clean chamfer. Nuts start easily, with no extra finishing required.

These popular, time saving machines are now available in four sizes, handling work up to 6 3/4" O.D. Their many cost cutting features are described and illustrated in our latest catalog that will be mailed promptly on request.

WRITE FOR ILLUSTRATED CATALOG.

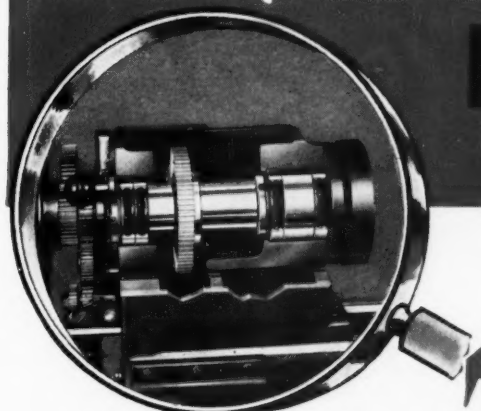
**MODERN MACHINE TOOL CO.**

Jackson, Michigan

Close-Up Look Tells Why... THE NEW 12" SWING

# LOGAN LATHE

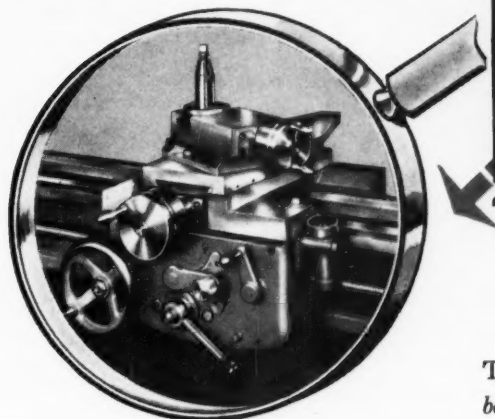
DELIVERS PLUS PERFORMANCE



## The HEADSTOCK

### Is Massive, Rigid, Convenient

Massively proportioned spindle means extreme rigidity on heavy cuts. Oversize ball bearing mounting assures sustained spindle accuracy. Outboard V-belt drive transmits power with maximum efficiency and simplifies belt changing or adjustment. Accessible gear-shift knobs add to operating convenience and safety.



## The CARRIAGE

### Is Newest, Finest Construction

Simple, lever-operated disc type clutch gives new operating convenience. Easily read, widely separated graduations on the extra large dials permit accurate readings. Precision ground top surfaces on cross slide and saddle permit mounting fixtures and use of magnetic indicators. Extra wide and long bearing surfaces on cross feed slide. Heavy, massive compound for rigidity. Apron operates in bath of oil.

SEE IT AT YOUR LOGAN LATHE DEALER'S, OR

Write for  
Information...

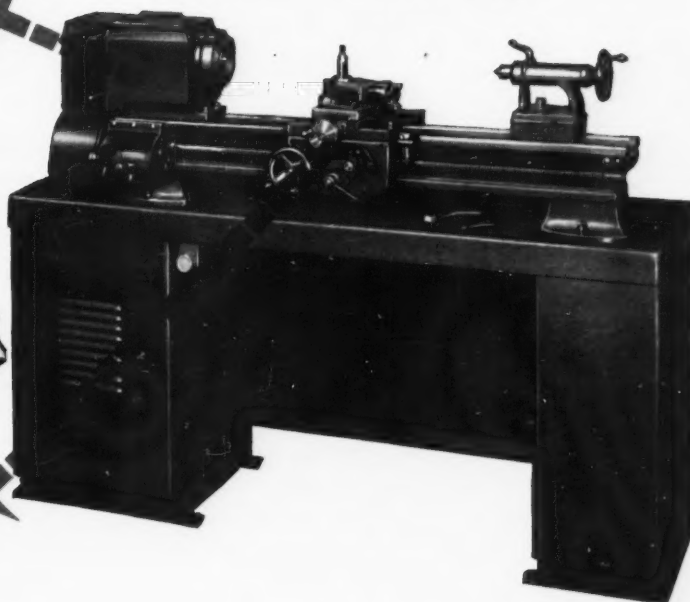
Full catalog descriptions and price information on request.

Write today to

LOOK TO LOGAN FOR BETTER LATHES AND SHAPERS

For more information on products advertised, use Inquiry Card, page 239

*For Production, Maintenance,  
Tool Room or School Shop*



The closer you inspect this new 12" swing Logan Lathe, the better it looks. The advanced design of individual parts, and the precision construction throughout become more evident. You will like the size, too. Its 35" center distance, 1 1/8" spindle hole, 1" collet capacity, and rugged, massive proportions mean extra capacity, stability and power. Keep this newest Logan in mind as you make plans for your production line, tool room, shop, or student training program. The quality you see in your close-up look will serve you well through extra years.



## Brief Specifications of Logan 12" Lathes

Swing over bed and saddle wings, 12"... Center Distances, 23" and 35"... Turret Lathes Models have 43" bed length... 1 1/8" spindle hole... 1" collet capacity... 16 spindle speeds, 38 to 1260 rpm.

MACHINERY, September, 1953—405



**LATHES, Duplicating**

H.E.B. Machine Tools, Inc., 475 Fifth Ave., New York 17, N. Y.  
 Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo.  
 Monarch Machine Tool Co., 27 Oak St., Sidney, Ohio.  
 Sidney Machine Tool Co., Sidney, Ohio.  
 Triplex Machine Tool Corp., 75 West St., New York 6, N. Y.

**LATHES, Engine and Toolroom**

American Tool Works Co., Pearl and Eggleston Aves., Cincinnati, Ohio.  
 Axelson Mfg. Co., P. O. Box 15335, Vernon Sta., Los Angeles 58, Calif.  
 Cincinnati Lathe & Tool Co., 3207-3211 Disney St., Oakley, Cincinnati 9, Ohio.  
 Consolidated Mch. Tool Corp., Rochester, N. Y.  
 Cosa Corp., 405 Lexington Ave., New York 17, N. Y.  
 Greaves Mch. Tool Co., 2009 Eastern Ave., Cincinnati, Ohio.

H.E.B. Machine Tools, Inc., 475 Fifth Ave., New York 17, N. Y.  
 Hendey Machine Co., Inc., Torrington, Conn.  
 LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.  
 Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo.  
 Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.  
 Logan Engrg. Co., 4901 W. Lawrence Ave., Chicago 30, Ill.  
 Monarch Machine Tool Co., 27 Oak St., Sidney, Ohio.  
 Morey Mchry. Co., Inc., 410 Broome St., New York, N. Y.  
 Nebel Machine Tool Co., 3401 Central Parkway, Cincinnati 25, Ohio.  
 Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.  
 Pratt & Whitney, West Hartford 1, Conn.  
 Reed-Prentice Corp., 677 Cambridge St., Worcester, Mass.  
 Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.

Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill.  
 Seneca Falls Mch. Co., Seneca Falls, N. Y.  
 Sheldon Mch. Co., Inc., 4240-4258 N. Knox Ave., Chicago 41, Ill.  
 Sidney Machine Tool Corp., Sidney, Ohio.  
 Simmons Machine Tool Corp., 1600 N. Broadway, Albany, N. Y.  
 South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.  
 Springfield Mch. Tool Co., Springfield, Ohio.

**LATHES, Gap**

Axelson Mfg. Co., P. O. Box 15335, Vernon Sta., Los Angeles 58, Calif.  
 Cincinnati Lathe & Tool Co., 3207-3211 Disney St., Oakley, Cincinnati 9, Ohio.  
 Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.  
 H.E.B. Machine Tools, Inc., 475 Fifth Ave., New York 17, N. Y.  
 LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.  
 Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.  
 Nebel Machine Tool Co., 3401 Central Parkway, Cincinnati 25, Ohio.  
 Seneca Falls Mch. Co., Seneca Falls, N. Y.  
 Sidney Machine Tool Co., Sidney, Ohio.  
 Springfield Mch. Tool Co., Springfield, Ohio.  
 Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

**LATHES, Gun**

Consolidated Mch. Tool Corp., Rochester, N. Y.  
 LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.  
 Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo.  
 Seneca Falls Mch. Co., Seneca Falls, N. Y.

**LATHES, Hollow Spindle**

Axelson Mfg. Co., P. O. Box 15335, Vernon Sta., Los Angeles 58, Calif.  
 LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.  
 Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo.  
 Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.  
 South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.

**LATHES, Manufacturing Type**

Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.  
 Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.

**LATHES, Spinning**

Bliss, E. W., Co., 1375 Raff Rd., S. W. Canton, Ohio.  
 Ferracute Machine Co., Bridgeton, N. J.

**LATHES, Toolroom**

See Lathes, Engine and Toolroom.

**LATHES, Turret**

Bardons & Oliver, Inc., Ft. W. 9th St., Cleveland 13, Ohio.  
 Brown & Sharpe Mfg. Co., Providence, R. I.  
 Bullard Co., Brewster St., Bridgeport 2, Conn.  
 Cosa Corp., 405 Lexington Ave., New York 17, N. Y.  
 Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.  
 Hardinge Brothers, Inc., (Bench or Cabinet Mounting), 1418 College Ave., Elmira, N. Y.  
 Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.  
 LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.  
 Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.  
 Millholland, W. K., Mchry. Co., 6402 Westfield Blvd., Indianapolis 5, Ind.  
 Morey Mchry. Co., Inc., 410 Broome St., New York, N. Y.  
 Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.  
 Potter & Johnston Co. (Automatic), 1027 Newport Ave., Pawtucket, R. I.  
 Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.  
 Simmons Mch. Tool Corp., 1600 N. Broadway, Albany, N. Y.  
 South Bend Lathe Works, 425 E. Madison St., South Bend, Ind.  
 Springfield Mch. Tool Co., Springfield, Ohio.  
 Triplex Machine Tool Corp., 75 West St., New York 6, N. Y.  
 Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

(Continued on page 408)

...the **SPOTLIGHT** is on the

**PRESS-RITE**

**60 TON POWER PRESS**



featuring...

- Press-Rite Airflex Clutch and Brake System
- One-Piece Heavy Duty Frame with Built-In Tie Rods
- Triple Ramway Lubrication
- Non-Repeat Single Stroke Mechanism
- Roller Bearing Flywheel



Write for this data-packed Bulletin... TODAY!

NOW... a 60-ton power press with all the famous Press-Rite features! Available in either flywheel or back-gear models, the Press-Rite No. 60 is designed with extra frame rigidity to practically eliminate deflection on heavy drawing and blanking operations. The large die space simplifies handling of bulky dies... cuts set-up time. The Press-Rite Airflex Clutch and Brake System delivers full stroke power through every operating cycle... provides positive, instantaneous braking action. High production... low maintenance... long dependable operation—these advantages make the Press-Rite No. 60 a profitable addition to your production line.

**Sales Service Machine Tool Co.**

PRESS RITE PRESSES • SHAPE RITE SHAPERS • KELLER POWER HACK SAWS

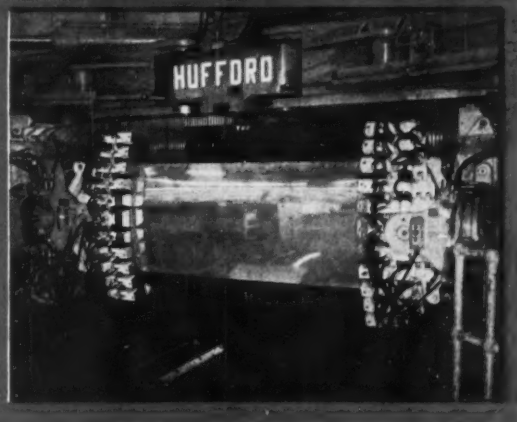
2351 UNIVERSITY AVENUE • ST. PAUL 4, MINNESOTA





*Deep Curves...  
Shallow Curves...*  
You save all ways with  
**HYDRA-CURVE!**

The jaws with the flexible action



ALL PHOTOS COURTESY NORTH AMERICAN AVIATION, INC.

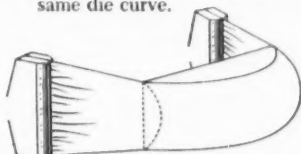
With Hufford HYDRA-CURVE Jaws you can now grip the edge of the work much closer to the die, save up to 30% of the sheet and get better fitting parts!

THESE DIAGRAMS SHOW WHY

Notice how the contour of the part continues from die to HYDRA-CURVE Jaws.



Now notice the change between straight jaws and the same die curve.



This exaggerated difference requires extra material to distribute stresses. YOU save this difference on *every* part with HYDRA-CURVE Jaws! Over a year's time these savings alone frequently pay the entire cost of a HYDRA-CURVE Jaw set.

You get other benefits too. Now you can form parts *directly from material in the ST condition*, avoid furnace hours. And, because overall stresses and wrinkling are reduced, parts come off better, are more accurate, cut assembly hours.

HYDRA-CURVE Jaws not only do a better job on all parts—they are stretch forming parts heretofore impossible by this process.

GET THE FACTS —The full HYDRA-CURVE story,

generously illustrated, is now available

—write for new brochure—it's free!



**LATHES, Vertical Turret**

American Steel Foundries, King Mch. Tool Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.  
 Bullard Co., Brewster St., Bridgeport 2, Conn.  
 Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.

**LAYOUT FLUID**

Dykem Co., 2303 P. North 11th St., St. Louis 6, Mo.

**LEVELS**

Bullard Co., Brewster St., Bridgeport 2, Conn.  
 Lufkin Rule Co., Hess Ave., Saginaw, Mich.  
 Millers Falls Co., Greenfield, Mass.  
 Pratt & Whitney, West Hartford 1, Conn.  
 Starrett, The L. S. Co., Athol, Mass.  
 Taft-Peirce Mfg. Co., Woonsocket, R. I.

**LOCKNUTS**

Link-Belt Co. (For Positioning Bearings), 519 N. Holmes Ave., Indianapolis 6, Ind.

**LUBRICANTS, Including Extreme Pressure (EP) Machinery Lubricants**

Air Conversion Research Corp., 4107 N. Damen Ave., Chicago 18, Ill.  
 Cities Service Oil Co., 70 Pine St., New York, N. Y.  
 Gulf Oil Corp., Gulf Bldg., Pittsburgh 30, Pa.  
 Houghton, E. F. & Co., 303 W. Lehigh Ave., Philadelphia, Pa.  
 Lubriplate Div., Fiske Bros. Refining Co., 129 Lockwood St., Newark 5, N. J.  
 Sinclair Refining Co., 630 5th Ave., New York, N. Y.  
 Standard Oil Co. (Indiana), 910 S. Michigan, Chicago, Ill.  
 Stuart, D. A., Oil Co., Ltd., 2739 S. Troy St., Chicago 23, Ill.  
 Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.  
 Texas Co., 135 E. 42nd St., New York, N. Y.  
 Tide Water Associated Oil Co., 17 Battery Place, New York, N. Y.

**LUBRICATING SYSTEMS**

Air Conversion Research Corp., 4107 N. Damen Ave., Chicago 18, Ill.  
 Farvel Corp., 3249 E. 80th St., Cleveland, Ohio.  
 Madison-Kipp Corp., Madison, Wis.  
 Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.  
 Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.

**MACHINISTS' SMALL TOOLS**

See Calipers, Hammers, Wrenches, Drills, Taps, Etc.

**MANDRELS**

See Arbors and Mandrels.

**MARKING MACHINES AND DEVICES**

Colonial Broach Co., P. O. Box 37, Harper Sta., Detroit, Mich.

**MEASURING MACHINES AND INSTRUMENTS, Precision**

Crane Packing Co., 1800 Cuyler Ave., Chicago, Ill.  
 Federal Products Corp., P. O. Box 1027, Providence, R. I.  
 Homestrand, Inc., Larchmont, N. Y.  
 Lufkin Rule Co., Hess Ave., Saginaw, Mich.  
 Pratt & Whitney, West Hartford 1, Conn.  
 Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.  
 Sheffield Corp., 721 Springfield, Dayton, Ohio.  
 Starrett, The L. S. Co., Athol, Mass.  
 Taft-Peirce Mfg. Co., Woonsocket, R. I.  
 Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass.

**MEASURING WIRES, THREAD, SPLINE AND GEAR**

Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass.  
 Taft-Peirce Mfg. Co., Woonsocket, R. I.

**METAL, Bearings**

See Bearings, Bronze, Babbitt, Etc., and Bushings, Brass, Bronze, Etc.

**METERS**

See Recording Instruments.

**MICROMETERS**

Ames, B. C., Co. (Dial), Waltham 54, Mass.  
 Brown & Sharpe Mfg. Co., Providence, R. I.  
 Lufkin Rule Co., Hess Ave., Saginaw, Mich.  
 Millers Falls Co., Greenfield, Mass.  
 Pratt & Whitney, West Hartford 1, Conn.  
 Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

Starrett, The L. S. Co., Athol, Mass.  
 Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass.

**MICROSCOPES, Toolmakers**

Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

**MILLING ATTACHMENTS**

Brown & Sharpe Mfg. Co., Providence, R. I.  
 Cincinnati Milling Machine Co., Cincinnati, Ohio.  
 Consolidated Machine Tool Corp., Rochester, N. Y.  
 Fray Machine Tool Co., 515 W. Windsor Rd., Glendale 4, Calif.  
 Gorton, George, Mch. Co., 1110 W. 13th St., Racine, Wis.  
 Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.  
 Kearney & Trecker Corp., Milwaukee, Wis.  
 Kempsmith Machine Co., 1819 S. 71st St., Milwaukee 14, Wis.  
 Northwestern Tool & Engrg. Co., 117 Hollier, Dayton, Ohio.  
 Pratt & Whitney, West Hartford 1, Conn.  
 Precise Products Corp., 1328-30 Clark St., Racine, Wis.  
 Reed-Prentice Corp., 677 Cambridge St., Worcester, Mass.  
 Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.  
 Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.  
 Turchan Follower Mch. Co., 8259 Livernois & Alaska Aves., Detroit, Mich.  
 Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass.  
 Van Norman Co., 3640 Main St., Springfield 7, Mass.

**MILLING AND CENTERING MACHINES**

Davis & Thompson Co., 6411 W. Burnham St., Milwaukee 14, Wis.  
 Jones & Lamson Mch. Co. (Automatic), 160 Clinton St., Springfield, Vt.  
 Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

**MILLING MACHINES, Automatic**

Cincinnati Milling Machine Co., Cincinnati, Ohio.  
 Consolidated Machine Tool Corp., Rochester, N. Y.  
 Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.  
 Hall Planetary Co., Fox St. and Abbotsford Ave., Philadelphia 29, Pa.  
 Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.  
 Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.  
 Kearney & Trecker Corp., Milwaukee, Wis.  
 New England Mch. & Tl. Co. (Electronic) Berlin, Pratt & Whitney, West Hartford 1, Conn.  
 Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.  
 Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.  
 U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

**MILLING MACHINES, Bench**

Hardinge Bros., Inc. (Bench or Pedestal Type), 1418 College Ave., Elmira, N. Y.  
 Pratt & Whitney, West Hartford 1, Conn.

**MILLING MACHINES, Circular Continuous**

Consolidated Machine Tool Corp., Rochester, N. Y.  
 Davis & Thompson Co., 6411 W. Burnham St., Milwaukee 14, Wis.  
 Espen-Lucas Mch. Works, Front St. and Girard Ave., Philadelphia, Pa.  
 Hall Planetary Co., Fox St. and Abbotsford Ave., Philadelphia 29, Pa.  
 Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.  
 Kearney & Trecker Corp., Milwaukee, Wis.  
 Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.  
 Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

**MILLING MACHINES, Duplex**

Cincinnati Milling Machine Co., Cincinnati, Ohio.  
 Consolidated Machine Tool Corp., Rochester, N. Y.  
 Espen-Lucas Mch. Works, Front St. and Girard Ave., Philadelphia, Pa.  
 Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.  
 Kearney & Trecker Corp., Milwaukee, Wis.  
 Nichols-Morris Corp., 76 Mamaroneck Ave., White Plains, N. Y.  
 Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.  
 Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.  
 U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

**MILLING MACHINES, Hand**

Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.  
 Nichols-Morris Corp., 76 Mamaroneck Ave., White Plains, N. Y.  
 Precise Products Corp., 1328-30 Clark St., Racine, Wis.  
 U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.  
 Van Norman Co., 3640 Main St., Springfield 7, Mass.

**MILLING MACHINES, Horizontal, Plain and Universal**

Austin Industrial Corp., 76 Mamaroneck Ave., White Plains, N. Y.  
 Brown & Sharpe Mfg. Co., Providence, R. I.  
 Cincinnati Milling Machine Co., Cincinnati, Ohio.  
 Columbia Export Co., Inc., 10-35 44th Dr., Long Island City, N. Y.  
 Consolidated Machine Tool Corp., Rochester, N. Y.  
 Cosa Corp., 405 Lexington Ave., New York 17.  
 Fray Machine Tool Co., 515 W. Windsor Rd., Glendale 4, Calif.  
 Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.  
 Greaves Mch. Tool Co., 2009 Eastern Ave., Cincinnati, Ohio.  
 Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.  
 Kearney & Trecker Corp., Milwaukee, Wis.  
 Kempsmith Machine Co., 1819 S. 71st St., Milwaukee 14, Wis.  
 Marac Mch. Corp., 1819 Broadway, New York, N. Y.  
 Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.  
 Pratt & Whitney, West Hartford 1, Conn.  
 Sheldon Machine Co., Inc., 4240-4258 N. Knox Ave., Chicago 41, Ill.  
 Simmons Mch. Tool Corp., 1600 N. Broadway, Albany, N. Y.  
 Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.  
 Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.  
 Van Norman Co., 3640 Main St., Springfield 7, Mass.

**MILLING MACHINES, Lincoln Type**

Brown & Sharpe Mfg. Co., Providence, R. I.  
 Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

**MILLING MACHINES, Planer Type**

Consolidated Mch. Tool Corp., Rochester, N. Y.  
 Espen-Lucas Mch. Works, Front St. and Girard Ave., Philadelphia, Pa.  
 Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.  
 Gray, G. A., Co., Woodburn Ave. and Penn. R. R. Evanston, Cincinnati, Ohio.  
 Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.  
 Kearney & Trecker Corp., Milwaukee, Wis.  
 Pratt & Whitney, West Hartford 1, Conn.

**MILLING MACHINES, Planetary Type**

Hall Planetary Co., Fox St. and Abbotsford Ave., Philadelphia 29, Pa.

**MILLING MACHINES, Profile**

Cincinnati Milling Machine Co., Cincinnati, Ohio.  
 Cosa Corp., 405 Lexington Ave., New York 17, N. Y.  
 Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.  
 Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.  
 Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.  
 Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.  
 Pratt & Whitney, West Hartford 1, Conn.  
 Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

**MILLING MACHINES, Ram Type Universal**

Fray Machine Tool Co., 515 W. Windsor Rd., Glendale 4, Calif.  
 Van Norman Co., 3640 Main St., Springfield 7, Mass.

**MILLING MACHINES, Turret Type**

Bridgeport Machines, Inc., Linley Ave., Bridgeport, Conn.

**MILLING MACHINES, Vertical**

Brown & Sharpe Mfg. Co., Providence, R. I.  
 Cincinnati Milling Machine Co., Cincinnati, Ohio.  
 Consolidated Mch. Tool Corp., Rochester, N. Y.  
 Ekstrom, Carlson & Co., 1437 Railroad Ave., Rockford, Ill.  
 Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.  
 Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.

(Continued on page 410)



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Now you can produce small duplicate parts speedily in unlimited quantities with precision known only to the toolroom!

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**RIVETT**

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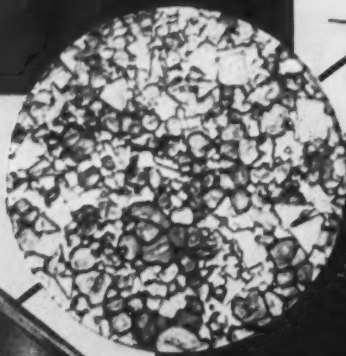
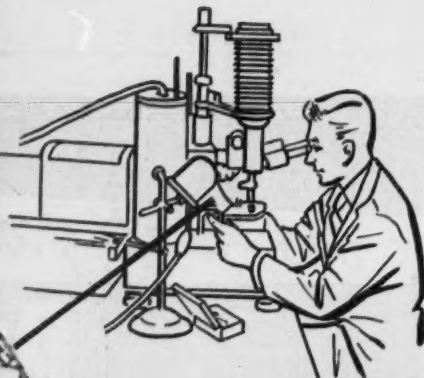
For More Precision Work RELY ON RIVETT LATHES AND GRINDERS, The Master Craftsman's Master Tools

For more information on products advertised, use Inquiry Card, page 239

MACHINERY, September, 1953—409



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# FOR YOU?

Our view of Kennametal discloses a sound, uniform physical structure that gives promise of consistently good mechanical properties. These are static until put to use on the job—translated into machining advantages for you.

We put more of the best into Kennametal so you may get more of the best out of it.

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THAT INCREASES PRODUCTIVITY



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Orban, Kurt Co., Inc., 205 East 42nd St., New York 17, N. Y.  
Pratt & Whitney, West Hartford 1, Conn.  
Reed-Prentice Corp., 677 Cambridge St., Worcester, Mass.  
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.  
Sunstrand Machine Tool Co., 2531 11th St., Rockford, Ill.

## MODEL AND EXPERIMENTAL WORK

See Special Machinery and Tools.

## MOLD AND DIE COPYING MACHINES

Cosa Corp., 405 Lexington Ave., New York 17, Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.  
Pratt & Whitney, West Hartford 1, Conn.  
Turchan Followler Mch. Co., 8259 Livernois & Alaska Aves., Detroit, Mich.

## MOLDING MACHINES, Plastic

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.  
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.  
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.  
Reed-Prentice Corp., 677 Cambridge St., Worcester, Mass.  
Rockford Machine Tool Co., 2500 Kiskadee St., Rockford, Ill.  
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

## MOTORS, Electric

Delco Products Div., General Motors Corp., 321 E. First St., Dayton, Ohio.  
General Electric Co., Schenectady, N. Y.  
National Pneumatic Co., Inc., 127 Armory St., Boston 19, Mass.  
Reliance Electric & Engrg. Co., 1074 Ivanhoe Rd., Cleveland 10, Ohio.  
Westinghouse Electric Corp., Pittsburgh 30, Pa.

## MOTORS, Hydraulic

Gerotor May Corp., Oliver St. and Maryland Ave., Baltimore, Md.  
Oilgear Co., 1560 W. Pierce St., Milwaukee 4, Wis.  
Sunstrand Machine Tool Co., 2531 11th St., Rockford, Ill.

## MULTIPLE-SLIDE FORMING MACHINES

Nilson Machine Co., A. H., 1506 Railroad Ave., Bridgeport, Conn.  
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

## NIBBLING MACHINES

Campbell Machine Div., American Chain & Cable Co., Inc., 929 Connecticut Ave., Bridgeport, Conn.

## NIBBLING MACHINES, Nickel

International Nickel Co., Inc., 67 Wall St., New York, N. Y.

## NIPPLE THREADING MACHINERY

Landis Machine Co., Inc., Waynesboro, Pa.

## NUT MAKING MACHINERY

National Machinery Co., Greenfield and Stanton Sts., Tiffin, Ohio.

## NUMBERING MACHINES

Numberall Stamp & Tool Co., Staten Island, N. Y.

## NUT SETTING EQUIPMENT

See Screw Driving and Nut Setting Equipment.

## NUT TAPPERS

See Bolt and Nut Machinery.

## NUTS, Cold Forged, Wing and Cap

Chicago Screw Co., Bellwood, Ill.  
Parker-Kalon Corp., 200 Varick St., New York 14, N. Y.  
Republic Steel Corp., (Union Drawn Steel Div.), Republic Bldg., Cleveland 1, Ohio.  
Union Drawn Steel Co., Div., Republic Steel Corp., Massillon, Ohio.

## NUTS, Self-locking

Grip Nut Co., 310 S. Michigan Ave., Chicago 4, Ill.

(Continued on page 412)



**TIGHTEN YOUR GRIP ON PRODUCTION**

Production flows faster and smoother when your machine tools are equipped with Jacobs Chucks.

Rugged construction, great gripping power and accuracy have made The Jacobs Plain Bearing Drill Chuck the choice of machinists throughout the world.

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Model 2029 BURR-MASTERS for chamfering and burring flywheel ring gears.

**CHAMFER and BURR**  
up to  
**20 TEETH PER SECOND!**

***Burr-Master***  
completes 156-tooth  
flywheel ring gear  
in 12 seconds



Type of chamfer produced on 20 flywheel ring gear teeth per second.

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Gears are loaded and unloaded without stopping the BURR-MASTER. The unskilled operator merely places the gear on the spindle. The rest is automatic. Cycle indicator light tells when the gear is finished.

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\*Reg. Patents  
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Northwestern Tool & Engrg. Co., 117 Hollier, Dayton, Ohio.  
Republic Steel Corp., Bolt and Nut Div., Republic Bldg., Cleveland 1, Ohio.

#### OIL CUPS

Gits Bros. Mfg. Co., 1846-62 Kilbourn Ave., Chicago, Ill.

#### OIL EXTRACTORS AND CLEANERS

De Laval Separator Co., Poughkeepsie, N. Y.

#### OIL GROOVERS

Wicaco Machine Co., Stenton Ave. and Loudon St., Philadelphia, Pa.

#### OIL-HOLE COVERS

Gits Bros. Mfg. Co., 1846-62 Kilbourn Ave., Chicago, Ill.

#### OIL SEALS

Crane Packing Co., 1800 Cuyler Ave., Chicago, Ill.  
Garlock Packing Co., Palmyra, N. Y.

#### OILERS AND LUBRICATORS

Air Conversion Research Corp., 4107 N. Damen Ave., Chicago 18, Ill.  
Bellows Co., 230 W. Market St., Akron, Ohio.  
Gits Bros. Mfg. Co., 1846-62 Kilbourn Ave., Chicago, Ill.  
Madison-Kipp Corp., Madison, Wis.

#### OILS, Cutting

See Cutting and Grinding Fluids.

#### OILS, Lubricating

Air Conversion Research Corp., 4107 N. Damen Ave., Chicago 18, Ill.  
Cities Service Oil Co., 70 Pine St., New York, N. Y.  
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.  
Gulf Oil Corp., Gulf Bldg., Pittsburgh 30, Pa.  
Houghton & Co., E. F., 303 W. Lehigh Ave., Philadelphia, Pa.  
Sinclair Refining Co., 630 5th Ave., New York, N. Y.  
Standard Oil Co., (Indiana), 910 S. Michigan, Chicago, Ill.  
Stuart Oil Co., Ltd., D. A., 2739 S. Troy St., Chicago 23, Ill.  
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.  
Texas Co., 135 E. 42nd St., New York, N. Y.  
Tide Water Associated Oil Co., 17 Battery Place, New York, N. Y.

#### OILS, Quenching and Tempering

Air Conversion Research Corp., 4107 N. Damen Ave., Chicago 18, Ill.  
Cities Service Oil Co., 70 Pine St., New York, N. Y.  
Gulf Oil Corp., Gulf Bldg., Pittsburgh 30, Pa.  
Houghton & Co., E. F., 303 W. Lehigh Ave., Philadelphia, Pa.  
Sinclair Refining Co., 630 5th Ave., New York, N. Y.  
Standard Oil Co., (Indiana), 910 S. Michigan, Chicago, Ill.  
Stuart Oil Co., Ltd., D. A., 2739 S. Troy St., Chicago 23, Ill.

#### OILS, Soluble

See Compounds, Cutting, Grinding, Metal Drawing, Etc.

#### OPTICAL FLATS

Crane Packing Co., 1800 Cuyler Ave., Chicago, Ill.

#### ORDNANCE MACHINES, Spetial

Rehnberg-Jacobson Mfg. Co., 2135 Kiskauke St., Rockford, Ill.

#### PACKING, Leather, Metal, Rubber, Asbestos, Etc.

Crane Packing Co., 1800 Cuyler Ave., Chicago, Ill.  
Garlock Packing Co., Palmyra, N. Y.  
Houghton & Co., E. F., 303 W. Lehigh Ave., Philadelphia, Pa.  
Watson-Stilman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

#### PARALLELS

Brown & Sharpe Mfg. Co., Providence, R. I.  
Lufkin Rule Co., Hess Ave., Saginaw, Mich.  
Starrett, The L. S., Co., Athol, Mass.  
Taft-Peirce Mfg. Co., Woonsocket, R. I.  
Walker, O. S., Co., Inc., Worcester, Mass.

#### PATTERNS, Wood and Metal

Mummert-Dixon Co., Hanover, Pa.

#### PHOSPHOR BRONZE

See Bronze.

(Continued on page 414)

# SAVES

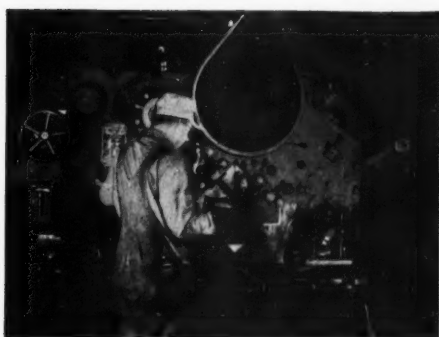
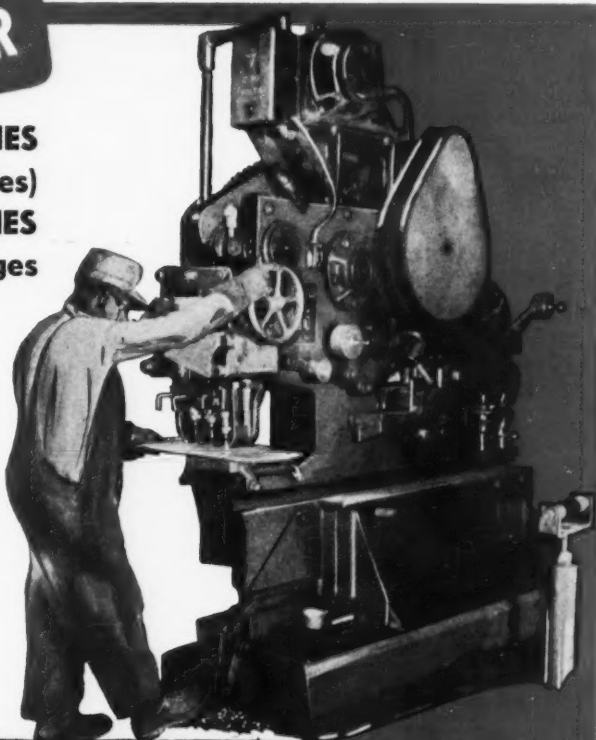
• SPACE • TIME  
• MONEY . . . by

multiple fabrication operations

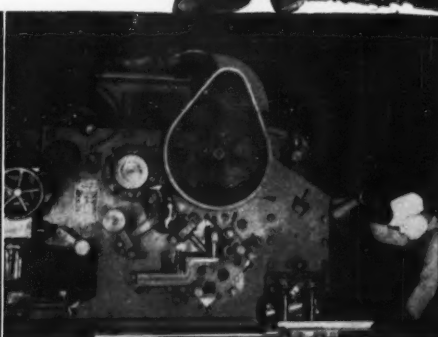
*"Buffalo"* UNIVERSAL  
IRON WORKER

- PUNCHES
- CUTS (bars, angles)
- SHEARS • COPEs • NOTCHES
- . . . without tool changes

Why give space to five machines to do the operations above, when this one machine can do them all? And it can handle up to three operations at once! Think of the space, time, and money this powerful, versatile machine can save in your shop. Write for Bulletin 360D and see the five models available to speed up fabrication on your angles, tees, channels, rounds and squares!



Cutting a 6 x 6 x 5/8" angle



Slitting a 3/4" tee

Punching 15/16" holes  
in 1" steel with triple  
punching attachment.

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**BUFFALO FORGE COMPANY**  
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DRILLING

PUNCHING

CUTTING

SHEARING

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# You **SAVE** with a **REID** Grinder

You might think that a grinder so efficient, labor-saving and precise as a Reid Grinder would cost a great deal. Because the Reid grinder is the preference of operators throughout industry, you might conclude that it is an expensive machine tool.

Actually, from the standpoint of *first cost*, the Reid grinder is economical.

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Its productivity, speed, and ability to improve work soon pay for the original investment.

Because the Reid grinder lessens operator fatigue and steps up production, it is a profitable tool.

*And*

... Reid's co-ordinated design, with its many proven better features, which anticipate future grinding needs, makes this masterpiece of machine tools a long-term, all-embracing economy to buy and operate.

*Comparison will prove!*

Write for bulletin 618-2.

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Shafer Bearing Corp., Downers Grove, Ill.  
S K F Industries, Inc., P. O. Box 6731, North Philadelphia, Pa.  
Standard Pressed Steel Co., Jenkintown, Pa.

## PIPE, BRASS AND COPPER

Air Conversion Research Corp., 4107 N. Damen Ave., Chicago 18, Ill.  
American Brass Co., 25 Broadway, New York, N. Y.  
Chase Brass & Copper Co., Inc., 1949 Rodney St., Waterbury 20, Conn.  
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.  
Revere Copper & Brass Inc., 230 Park Ave., New York, N. Y.

## PIPE STEEL

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.  
Bethlehem Steel Co., Bethlehem, Pa.  
Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.  
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.  
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.  
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.  
United States Steel Corp., National Tube Co., Div., 436 7th Ave., Pittsburgh, Pa.

## PIPE THREADING AND CUTTING MACHINES

Landis Machine Co., Inc., Waynesboro, Pa.

## PIPE TONGS

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.

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Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.  
Gray, G. A., Co., Woodburn Ave. and Penn R. R., Evanston, Cincinnati, Ohio.  
Northwestern Tool & Engrg. Co., 117 Hollier, Dayton, Ohio.  
Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill.  
Turchan Follower Mch. Co., 8259 Livernois & Alaska Aves., Detroit, Mich.

## PLANERS, Double Housing and Openside

Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.  
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio (Plate).  
Consolidated Mch. Tool Corp. (Incl. Plate, Rotary and Crank Types), Rochester, N. Y.  
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.  
Gray, G. A., Co., Woodburn Ave. and Penn R. R., Evanston, Cincinnati, Ohio.  
Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill.

## PLASTIC AND PLASTIC PRODUCTS

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## PLATE ROLLS

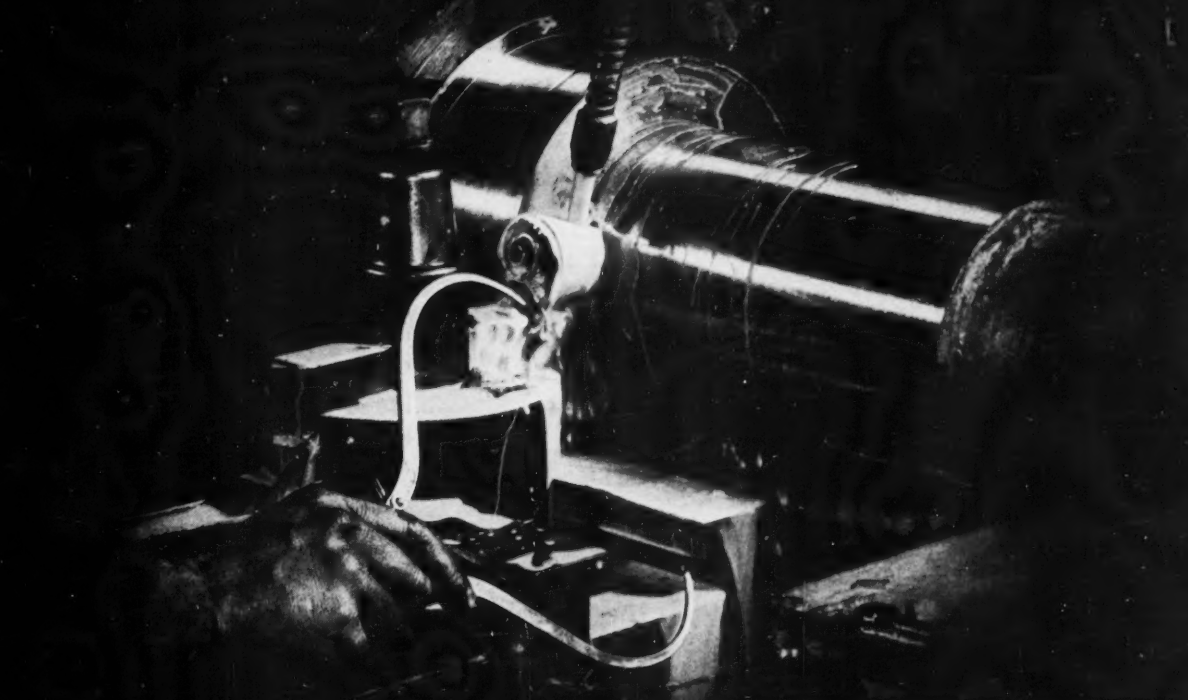
Baldwin-Lima-Hamilton Corp., Lima-Hamilton Div., Hamilton, Ohio.  
Bethlehem Steel Co., Bethlehem, Pa.  
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.  
Consolidated Mch. Tool Corp., Rochester, N. Y.  
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.

## PLATES, Surface

Brown & Sharpe Mfg. Co., Providence, R. I.  
Brush Electronics Co., 3405 Perkins Ave., Cleveland 14, Ohio.  
Challenge Machinery Co., Grand Haven, Mich.  
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.  
Pratt & Whitney Div., West Hartford 1, Conn.  
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.  
Taff-Peirce Mfg. Co., Woonsocket, R. I.  
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.  
Vincor Corp., 9113 Schaefer Highway, Detroit 28, Mich.

(Continued on page 416)

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From the heaviest roughing cut down to the finest precision cut, Axelson lathes are designed and manufactured to give precise, accurate service. Critical dimensions "stay put" because each Axelson lathe part is produced under strict metallurgical control. Recording pyrometers keep continuous time and temperature records of hardening, tempering and normalizing operations on gears, spindles, shafts, lead screws, etc. Quality built, Axelson lathes are capable of delivering dependable, accurate work under the most difficult operating conditions.

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Axelson manufactures heavy duty engine lathes in 16", 20", 25", and 32" sizes of various lengths; precision tool room lathes; a 20" medium duty engine lathe; gap lathes.

**AXELSON**

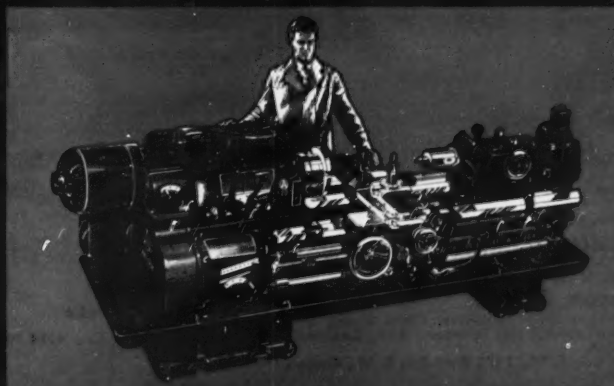
*Lathes*

PSC

THERE IS NO ECONOMICAL  
SUBSTITUTE FOR QUALITY



**CHOSEN FIRST . . . . TO LAST!**



TOOL ROOM LATHES • GAP BED LATHES • HEAVY DUTY ENGINE LATHES  
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 Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.  
 Cleco Div., Reed Roller Bit Co., 5125 Clinton Ave., Houston 20, Texas.  
 Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.  
 Ingersoll-Rand Co., Phillipsburg, N. J.  
 Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa.  
 Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.  
 Mead Specialties Co., 4114 North Knox Ave., Chicago 41, Ill.  
 National Pneumatic Co., Inc., 127 Army St., Boston 19, Mass.  
 Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.  
 Thor Power Tool Co., Aurora, Ill.

**POLISHING LATHES AND MACHINES**

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 Gardner Machine Co., (Div. Landis Tool Co.), 414 E. Gardner St., Beloit, Wis.  
 Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich.  
 Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.  
 Millers Falls Co., Greenfield, Mass.  
 Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.  
 Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.  
 United States Electrical Tool Div., Emerson Elec. Mfg. Co., 1050 Findlay St., Cincinnati 14, Ohio.

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Cleco Div., Reed Roller Bit Co., 5125 Clinton Ave., Houston 20, Texas.  
 Jarvis, Charles L., Co., Middletown, Conn.  
 Precise Products Corp., 1328-30 Clark St., Racine, Wis.  
 Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.  
 United States Electrical Tool Div., Emerson Elec. Mfg. Co., 1050 Findlay St., Cincinnati 14, Ohio.

**POWER UNITS, Hydraulic**

See Hydraulic Power Units or Tool Heads.

**PRESSES, Air**

Fanco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.

**PRESSES, Arbor**

Bellows Co., 230 W. Market St., Akron, Ohio.  
 Baldwin-Lima-Hamilton Corp., Lima-Hamilton Div., Hamilton, Ohio.  
 Dake Engine Co., 604 Seventh St., Grand Haven, Mich.  
 Fanco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.  
 Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.  
 Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.  
 Tomkins-Johnson Co., 614 No. Mechanic St., Jackson, Mich.  
 Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.  
 Wilson, K. R., 215 Main St., Buffalo, N. Y.

**PRESSES, Broaching**

American Broach & Mch. Co., Ann Arbor, Mich.  
 Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.  
 Colonial Broach Co., Detroit 13, Mich.  
 Dake Engine Co., 604 Seventh St., Grand Haven, Mich.  
 Ferracute Machine Co., Bridgeton, N. J.  
 Lake Erie Engrg. Co., Kenmore Station, Buffalo, N. Y.  
 Lapointe Machine Tool Co., 34 Tower St., Hudson, Mass.  
 Oilgear Co., 1560 W. Pierce St., Milwaukee 4, Wis.  
 Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

**PRESSES, Die Tryout**

Alpha Tool Works, 9281 Freeland Ave., Detroit 28, Mich.

**PRESSES, Extrusion**

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.  
 Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.  
 Chambersburg Engrg. Co., Chambersburg, Pa.  
 Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.  
 Lake Erie Engrg. Co., Kenmore Station, Buffalo, N. Y.  
 Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

**PRESSES, Foot**

Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.  
 Fanco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.  
 Ferracute Machine Co., Bridgeton, N. J.  
 Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.  
 V & O Press Co., Div. Emhart Mfg. Co., Hudson, N. Y.

**PRESSES, Forging**

Ajax Mfg. Co., Euclid, Cleveland 17, Ohio.  
 American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.  
 Baldwin-Lima-Hamilton Corp., Lima-Hamilton Div., Hamilton, Ohio.  
 Bethlehem Steel Co., Bethlehem, Pa.  
 Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.  
 Clearing Machine Corp., 6499 W. 65th St., Chicago 38, Ill.  
 Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.  
 Dake Engine Co., 604 Seventh St., Grand Haven, Mich.  
 Erie Foundry Co., Erie, Pa.  
 Ferracute Machine Co., Bridgeton, N. J.  
 Henry & Wright Div., Emhart Mfg. Co., 760 Windsor St., Hartford 1, Conn.  
 Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.  
 Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.  
 Morgan Engrg. Co., Alliance, Ohio.  
 National Mchry. Co., Greenfield and Stanton Sts., Tiffin, Ohio.  
 Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.  
 V & O Press Co., Div. Emhart Mfg. Co., Hudson, N. Y.  
 Verson Allsteel Press Co., 93rd St. and S. Kenwood Ave., Chicago, Ill.  
 Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.  
 Wilson, K. R., 215 Main St., Buffalo, N. Y.  
 Wood, R. D., Co., Public Ledger Bldg., Philadelphia 5, Pa.  
 Zeh & Hahnemann Co., 182 Vanderpool St., Newark, N. J.

**PRESSES, Hydraulic**

American Broach & Mch. Co., Ann Arbor, Mich.  
 American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.  
 Anderson Bros. Mfg. Co., 1910 Kishwaukee St., Rockford, Ill.  
 Baldwin-Lima-Hamilton Corp., Lima-Hamilton Div., Hamilton, Ohio.  
 Bethlehem Steel Co., Bethlehem, Pa.  
 Birdsboro Steel Fdry. & Mch. Co., Birdsboro, Pa.  
 Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.  
 Chambersburg Engrg. Co., Chambersburg, Pa.  
 Clearing Machine Corp., 6499 W. 65th St., Chicago 38, Ill.  
 Clifton Hydraulic Press Co., Clifton, N. J.  
 Colonial Broach Co., P. O. Box 37, Harper Sta., Detroit, Mich.  
 Dake Engine Co., 604 Seventh St., Grand Haven, Mich.  
 Denison Engrg. Co., 1160 Dublin St., Columbus 16, Ohio.  
 Erie Foundry Co., Erie, Pa.  
 Farrell-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.  
 Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.  
 Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.  
 Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.  
 Lapointe Machine Tool Co., 34 Tower St., Hudson, Mass.  
 Morgan Engrg. Co., Alliance, Ohio.  
 Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.  
 Oilgear Co., 1560 W. Pierce St., Milwaukee 4, Wis.  
 Turner Bros., Inc., 2625 Hilton Rd., Ferndale 20, Mich.  
 Verson Allsteel Press Co., 93rd St. and S. Kenwood Ave., Chicago, Ill.  
 Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.  
 Wilson, K. R., 215 Main St., Buffalo, N. Y.  
 Wood, R. D., Co., Public Ledger Bldg., Philadelphia 5, Pa.

**PRESSES, Pneumatic**

Mead Specialties Co., 4114 North Knox Ave., Chicago 41, Ill.

**PRESSES, Screw**

Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.  
 Dake Engine Co., 604 Seventh St., Grand Haven, Mich.  
 Ferracute Machine Co., Bridgeton, N. J.

Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.  
 Walsh Press & Die Co., 4727 W. Kinzie St., Chicago 44, Ill.  
 Zeh & Hahnemann Co., 182 Vanderpool St., Newark, N. J.

**PRESSES, Sheet Metal Working**

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.  
 Baldwin-Lima-Hamilton Corp., Lima-Hamilton Div., Hamilton, Ohio.  
 Bath, Cyril Co., 6984 Machinery Ave., Cleveland 3, Ohio.  
 Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.  
 Chambersburg Engrg. Co., Chambersburg, Pa.  
 Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.  
 Clearing Machine Corp., 6499 W. 65th St., Chicago 38, Ill.  
 Cleveland Crane & Engrg. Co., Wickliffe, Ohio.  
 Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.  
 Consolidated Mch. Tool Corp., Rochester, N. Y.  
 Dake Engine Co., 604 Seventh St., Grand Haven, Mich.  
 Danly Machine Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.  
 Dreis & Krump Mfg. Co., 7416 Loomis Blvd., Chicago 36, Ill.  
 Espen-Lucas Machine Works, Front St. and Girard Ave., Philadelphia, Pa.  
 Fanco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.  
 Ferracute Machine Co., Bridgeton, N. J.  
 Henry & Wright Div., Emhart Mfg. Co., 760 Windsor St., Hartford 1, Conn.  
 Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.  
 Johnson Mch. & Press Corp., 620 W. Indiana Ave., Elkhart, Ind.  
 Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.  
 L & J Press Corp., Elkhart, Ind.  
 Minster Machine Co., Minster, Ohio.  
 Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.  
 Peck, Stow & Wilcox Co., Southington, Conn.  
 Sales Service Mch. Tool Co., 2363 University Ave., St. Paul, Minn.  
 Verson Allsteel Press Co., 93rd St. and S. Kenwood Ave., Chicago, Ill.  
 V & O Press Co., Div. Emhart Mfg. Co., Hudson, N. Y.  
 Walsh Press & Die Co., 4727 W. Kinzie St., Chicago 44, Ill.  
 Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.  
 Wilson, K. R., 215 Main St., Buffalo, N. Y.  
 Zeh & Hahnemann Co., 182 Vanderpool St., Newark, N. J.

**PRESSES, Straightening**

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.  
 Anderson Bros. Mfg. Co., 1910 Kishwaukee St., Rockford, Ill.  
 Baldwin-Lima-Hamilton Corp., Lima-Hamilton Div., Hamilton, Ohio.  
 Chambersburg Engrg. Co., Chambersburg, Pa.  
 Colonial Broach Co., P. O. Box 37, Harper Sta., Detroit, Mich.  
 Consolidated Mch. Tool Corp., Rochester, N. Y.  
 Dake Engine Co., 604 Seventh St., Grand Haven, Mich.  
 Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.  
 Hufford Machine Works, Inc., 1700 E. Grand Ave., El Segundo, Calif.  
 Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.  
 Morgan Engrg. Co., Alliance, Ohio.  
 Niagara Machine & Tool Works, (Hydraulic) 683 Northland Ave., Buffalo, N. Y.  
 Oilgear Co., 1560 W. Pierce St., Milwaukee 4, Wis.  
 Springfield Mch. Tool Co., Springfield, Ohio.  
 Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.  
 Wilson, K. R., 215 Main St., Buffalo, N. Y.

**PROFILE—TRACING ATTACHMENTS**

Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa. (Lathe)

**PROFILING MACHINES**

Consolidated Mch. Tool Corp., Rochester, N. Y.  
 Cosa Corp., 405 Lexington Ave., New York 17, N. Y.  
 Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.  
 Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.  
 Gorton, George, Machine Co., 1110 W. 13th St., Racine, Wis.  
 Morey Mchry. Co., Inc. (and affiliated companies), 410 Broome St., New York, N. Y.  
 Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.  
 Pines Engineering Co., Inc., Aurora, Ill.  
 Pratt & Whitney, West Hartford 1, Conn.  
 Sheffield Corp., 721 Springfield, Dayton, Ohio.  
 (Continued on page 418)



# DESIGNED for the job!!!

*Just as this Baush Multi-Spindle Tapper was designed to tap 50 holes simultaneously in the Pan Rail of a Tank engine, SO TOO can Baush design and build automatic multi-spindle and multi-operation machine tools to speed up your production and increase your profits.*

## SPECIFICATIONS:

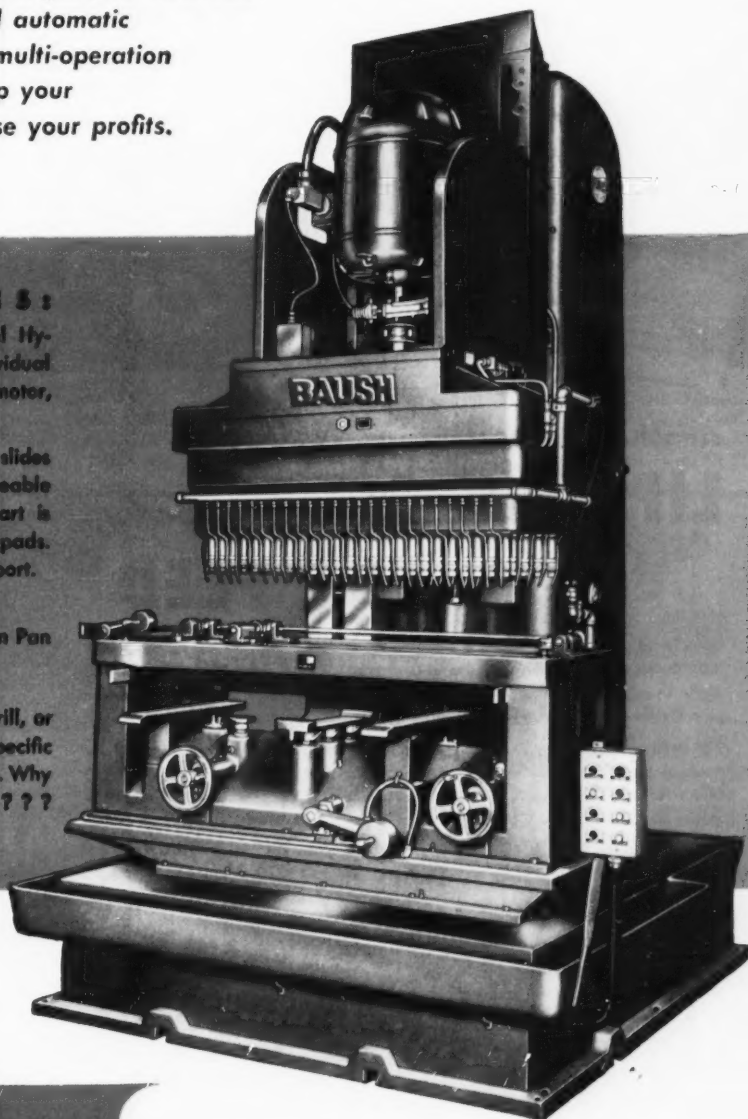
Unit illustrated is Baush W-8 Vertical Hydraulic Tapping machine with 50 individual leadscrew spindles driven by a 30 HP motor, and equipped with coolant pump.

Holding fixture is of Tunnel Type. Part slides on rails between guide strips and moveable locators interlock electrically while part is cam clamped against hardened rest pads. Each end has hand-operated jack support.

## OPERATION:

Tapping 50 —  $\frac{3}{8}$ "  $\times$  16 Thread holes in Pan Rail of Tank Engine.

Whether it be a simple multi-spindle drill, or Automatic Transfer you need for your specific job, Baush Engineers are at your service. Why not let us help speed up your work ??? Send us your job prints today.

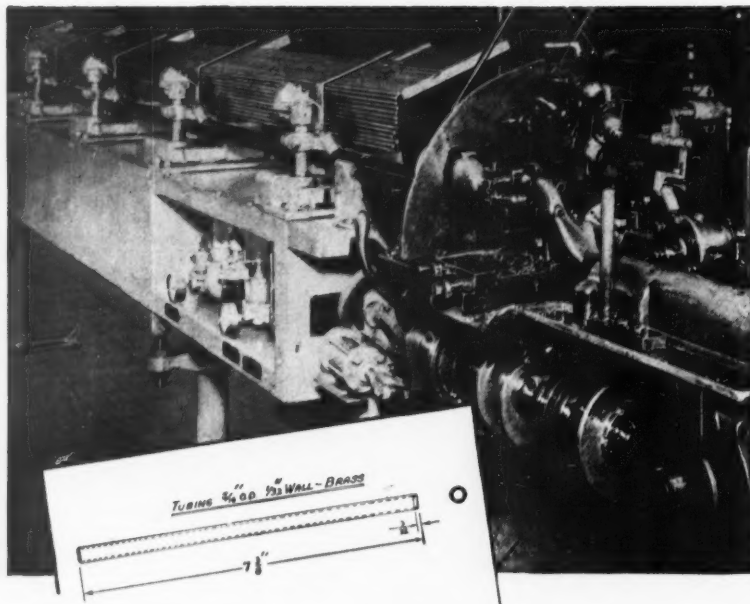


**B**  
**BAUSH**  
MACHINE TOOL CO.  
SPRINGFIELD 7, MASSACHUSETTS



# Increases Actual Gross 71%....

## Produces 94% of Increased Gross!



Another Screw Machine Record with

## LIPE Automatic Magazine Loading BAR FEED

**THE JOB**—Part shown above made by Trico Products Co., Buffalo, N. Y., on #00G B&S Screw Machine. Length of this part required 7 feed-outs of the feed fingers. Cycle time: 3 secs.—an actual gross of 1200/hr. Best average production with one man handling this and one other machine: 600/hr.

**THE IMPROVEMENT**—Lipe Automatic Magazine Loading Bar Feed was installed on machine producing part. Cycle time cut to 1 3/4 secs. Actual gross upped to 2057/hr. A.M.L. Bar Feed, eliminating "cutting air," obtained 94% of actual gross, or 1930 pieces per hour. A production increase of 221%! Further savings: Same operator now runs four machines, two equipped with A.M.L. Bar Feeds.

**THE LESSON**—By feeding stock through the collet much faster, Lipe Automatic Bar Feeds increase production on the great majority of screw machine work pieces.

### BIG Production Gains on a wide variety of work, BECAUSE—

- Stock is fed to screw machine all the time—not dependent on operator.
- Avoids multiple feed finger feed-outs.
- Feed-out pressure always behind stock.
- Model AML gives maximum output of machine—no "cutting air."
- Eliminates feed fingers.
- Saves in changeover set-up time.

Get full details on how this machine will increase production and save you money. It's today's big advancement in screw machine stock feeding. Our engineers will gladly study your problem—no obligation.



**Lipe - ROLLWAY CORPORATION**

Manufacturers of Automatic Clutches and Machine Tools  
Syracuse 1, N. Y.

### PULLEYS

Boston Gear Works, 3200 Main St., North Quincy 71, Mass.

### PULLEYS, Friction Clutch

Brown & Sharpe Mfg. Co., Providence, R. I.

### PUMPS, Coolant, Lubricant and Oil

Brown & Sharpe Mfg. Co., Providence, R. I.  
Delta Power Tool Div., Rockwell Mfg. Co., 620 E. Vienna Ave., Milwaukee, Wis.  
Ingersoll-Rand Co., Phillipsburg, N. J.  
Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.  
Pioneer Pump & Mfg. Co., 19679 John R St., Detroit, Mich.  
Ruthman Machinery Co., 1809 Reading Rd., Cincinnati 12, Ohio.  
Sier-Bath Gear & Pump Co., Inc., 9248 Hudson Blvd., North Bergen, N. J.  
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.  
Tompkins-Johnson Co., Jackson, Mich.  
Tuthill Pump Co., 939 E. 95th St., Chicago 19, Ill.  
Vickers, Inc., 1402 Oakman Blvd., Detroit, Mich.  
Viking Pump Co., Cedar Falls, Iowa.

### PUMPS, Hydraulic

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.  
Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.  
Barnes, John S. Corp., Rockford, Ill.  
Bethlehem Steel Co., Bethlehem, Pa.  
Brown & Sharpe Mfg. Co., Providence, R. I.  
Chambersburg Engrg. Co., Chambersburg, Pa.  
Denison Engrg. Co., 1160 Dublin St., Columbus 16, Ohio.  
Geratof May Corp., Oliver St. and Maryland Ave., Baltimore, Md.  
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.  
Ingersoll-Rand Co., Phillipsburg, N. J.  
Lapointe Machine Tool Co., 34 Tower St., Hudson, Mass.  
Oilgear Co., 1560 W. Pierce St., Milwaukee 4, Wis.  
Sier-Bath Gear & Pump Co., Inc., 9248 Hudson Blvd., North Bergen, N. J.  
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.  
Tuthill Pump Co., 939 E. 95th St., Chicago 19, Ill.  
Vickers, Inc., 1402 Oakman Blvd., Detroit, Mich.  
Viking Pump Co., Cedar Falls, Iowa.  
Vince Corp., 9113 Schaefer Highway, Detroit 28, Mich.  
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

### PUMPS, Pneumatic

Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.  
Cleco Div., Reed Roller Bit Co., 5125 Clinton Ave., Houston 20, Texas.  
Ingersoll-Rand Co., Phillipsburg, N. J.  
Thor Power Tool Co., Aurora, Ill.

### PUMPS, Rotary

Brown & Sharpe Mfg. Co., Providence, R. I.  
Pioneer Pump & Mfg. Co., 19679 John R St., Detroit, Mich.  
Sier-Bath Gear & Pump Co., Inc., 9248 Hudson Blvd., North Bergen, N. J.  
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.  
Thor Power Tool Co., Aurora, Ill.  
Tuthill Pump Co., 939 E. 95th St., Chicago 19, Ill.  
Vickers, Inc., 1402 Oakman Blvd., Detroit, Mich.  
Viking Pump Co., Cedar Falls, Iowa.

### PUNCHES AND DIES

See Dies, Sheet Metal, Etc.

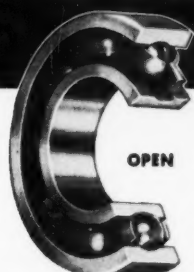
### PUNCHES, Centaring

Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.

### PUNCHING MACHINERY

Bath, Cyril Co., 6984 Machinery Ave., Cleveland 3, Ohio.  
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.  
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.  
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.  
Consolidated Mch. Tool Corp., Rochester, N. Y.  
(Continued on page 420)

# NICE



OPEN



SHIELDED



COMPOSITION  
SEALED

"1600" Series Low Cost Precision Radial Bearings and "3000" Series Unground "Precision Type" Radials, Metal Shielded or Open, or with Composition Seals, Inch Sizes. Also "C" Series Precision Radial Bearings Metal Shielded or Open in established Light Duty Inch Standard Sizes. All Solid Inner and Outer Race Type with Retainer, as illustrated.



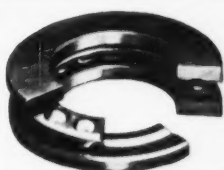
"500" Series Unground Radial and Thrust, Full Ball Type, Pressed Cone, Soft Outer Band, Inch Sizes.



"700" Series, similar to "500" Series except Solid Cone.



"FR" Series Flat Race Ground Thrust with Solid Brass Ball Retainer, Inch Sizes.



Ground Thrusts, Series "1000", "1100", "2600" and "2700", with Retainer, Inch and Metric Sizes.

## PRECISION SEMI-PRECISION AND UNGROUND



"600" Series and Automotive "Steering Knuckle" Self-contained Unground Thrusts, Full Ball Type, Soft Outer Band, Inch Sizes.



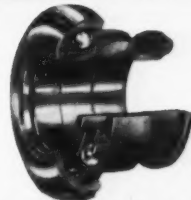
"400" Series Unground Deep Groove Radial, Full Ball Type, Soft Outer Band, Inch Sizes.



"1200" Series, Similar to "400" Series Except Double Row.



"Flanged" Series, Similar to "400" Series Except Outer Band Flanged.



"Clutch Release" Bearings, Angular Contact and Thrust Types, for Automobile, Truck, Bus, Tractor, Farm Machinery and Industrial Applications.

## STANDARD and SPECIAL BALL BEARINGS SINCE 1902



SERIES 7500  
DOUBLE  
SEALED

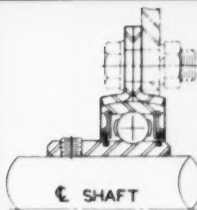


SERIES 7600  
DOUBLE  
SEALED

"7500" Series and "7600" Series Precision Radial Bearings with Labyrinth Composition Seals. Solid Inner and Outer Race Type with Retainer, Inch Sizes.

ALSO  
BALL BEARING  
SHEAVES, WHEELS  
AND  
TROLLEY WHEELS

Write for  
Cat. No. 150



SHAFT



"F100" Series Flange Mounted Self-aligning Radial Bearings designed for easy application to Machine Frames. Solid Inner and Outer Race Type with Retainer, Labyrinth Composition Seals, Two Locking Set Screws. Popular Inch Shaft Sizes.

**NICE BALL BEARING COMPANY**  
NICETOWN · PHILADELPHIA · PENNSYLVANIA

# HELD IN QUARANTINE

**... and not released  
until proved fit!**

That's the fate of all PERKINS precision, custom-made GEARS prior to shipment. The folks in our inspection department — a section of which is shown — may be a suspicious lot (never mind what some other people in our plant call them), but when they certify a gear to be sound and "as specified" you can bet your last bottom dollar that the end-product of which they ultimately become an integral part, will be a better product!

**NOTE 1:** A new product is the Perkins Precision Spring Coiler. This coiler (patent applied for) turns out precision springs — any type, shape, size, from wire sizes .005 to .125.

**2:** Another new product — the Perkins "Bendit 15" — a patented metal forming machine bends and shapes sheets, rods; strips tubing into innumerable complex as well as simple forms that would be difficult or impossible to make by other means. Eliminates need for expensive tools or specialized skills. Ht. 47", net wt. 200 lbs. Write today for descriptive catalogs, prices etc.



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Helical Gears  
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Worm Gears  
Spiral Gears  
Spur Gears with  
shaved or ground teeth  
Ground Thread Worms

## PERKINS MACHINE & GEAR COMPANY

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Famco Machine Tool Co., 3134 Sheridan Rd., Kenosha, Wis.  
Ferracute Machine Co., Bridgeton, N. J.  
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.  
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.  
O'Neil-Irwin Mfg. Co., Lake City, Minn.  
Ryerson Joseph T. & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.  
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.  
Wiedemann Machine Co., 4272 Wissahickon Ave., Philadelphia, Pa.

#### RACKS, Gear Cut

Amgears, Inc., 6633 W. 65th St., Chicago 38, Ill.  
Atlantic Gear Works, Inc., 200 Lafayette St., New York 12, N. Y.  
Boston Gear Works, 3200 Main St., North Quincy 71, Mass.  
Brown & Sharpe Mfg. Co., Providence, R. I.  
Gear Specialties, Inc., 2635 W. Medill Ave., Chicago 47, Ill.  
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.  
James, D. O., Gear Mfg. Co., 1140 W. Monroe St., Chicago 7, Ill.  
Massachusetts Gear & Tool Co., 36 Nassau St., Woburn, Mass.  
Ohio Gear Co., 1333 E. 179th St., Cleveland, Ohio.  
Philadelphia Gear Works, Inc., Erie Ave. and G St., Philadelphia, Pa.  
Stahl Gear & Mch. Co., 3901 Hamilton Ave., Cleveland 14, Ohio.

#### REAMER HOLDERS

Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.  
Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.  
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.  
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.  
Warner & Swasey Co., 8701 Carnegie Ave., Cleveland 3, Ohio.

#### REAMERS

Atrax Co., Newington, Conn.  
Barber-Colman Co., Rock and Montague, Rockford, Ill.  
Butterfield Div., Union Twist Drill Co., Derby Line, Vt.  
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 27, Mich.  
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.  
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.  
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.  
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.  
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.  
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.  
Greenfield Tap & Die Corp., Greenfield, Mass.  
Haynes Stellite Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.  
Illinois Tool Works, 2501 North Keeler Ave., Chicago, Ill.  
Keo Cutters, 19326 Woodward, Detroit, Mich.  
Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.  
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.  
Morse Twist Drill & Mch. Co., New Bedford, Mass.  
National Twist Drill & Tool Co., & Winter Bros. Co., Rochester, Mich.  
Pratt & Whitney, West Hartford 1, Conn.  
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.  
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.  
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.  
Taft-Peirce Mfg. Co., Woonsocket, R. I.  
Union Twist Drill Co., Athol, Mass.  
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.  
Wiley's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

#### REAMERS, Adjustable

Barber-Colman Co., Rock and Montague, Rockford, Ill.  
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.  
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.  
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.  
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.

(Continued on page 422)

# LINDNER

## No. 15 Jig Borer



Direct-reading Optical System is free from mechanical wear  
Readings in .00005" . . . settings guaranteed accurate to .00015"  
Longitudinal and transverse table movements 40" x 24"  
Distance between table surface and boring spindle 10", 30", 34", 38"  
Boring spindle speeds infinitely variable from 50-1900 RPM  
Maximum boring diameter from the solid 1 19/32"  
Maximum boring diameter 10" diameter of milling cutter 5"  
Model 14 with 24" x 16" table movements also available

Write for literature and complete specifications

4 weeks delivery . . .  
subject to prior sale



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For more information on products advertised, use Inquiry Card, page 239

MACHINERY, September, 1953—421





Spur  
Helical  
Worm  
Herringbone  
Internal  
\*Coniflex Bevel  
Spiral Bevel  
Spline Shaft

Transcribed music in our plant, for our employees' enjoyment while they work; a baseball team for their recreation after work . . . these are just two of the many details we attend to, in our efforts to maintain high employee morale and efficiency so necessary for consistent production of a quality product—the best in custom gears. They're just further reasons why every gear order you place with Cincinnati Gear will be handled to your complete satisfaction.

\*Reg. U. S. Pat. Off.



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"Gears . . . Good Gears Only"

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## Let's talk about Diamonds.....

During 1952 approximately 13½ million carats of Diamonds were imported into the United States, the major portion of which were mined in the Belgian Congo.

Of this amount only 5 per cent. were suitable for gems.

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J. K. Smit know-how and integrity, proved throughout industry, stands ready to serve you in any capacity when your problem concerns the use of Diamond Tools or Wheels.

**J. K. SMIT & SONS, INC.**  
MURRAY HILL, N. J.  
DETROIT • • • TORONTO



Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.  
Greenfield Tap & Die Corp., Greenfield, Mass.  
McCroskey Tool Corp., 1938 Thomas St., Meadville, Pa.  
Morse Twist Drill & Mch. Co., New Bedford, Mass.  
Pratt & Whitney, West Hartford 1, Conn.  
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.  
Taft-Peirce Mfg. Co., Woonsocket, R. I.  
Union Twist Drill Co., Athol, Mass.  
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.  
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

### REAMERS, Taper Pin

Butterfield Div., Union Twist Drill Co., Derby Line, Vt.  
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.  
Greenfield Tap & Die Corp., Greenfield, Mass.  
Kaufman Manufacturing Co., Manitowoc, Wis.  
Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.  
Morse Twist Drill & Mch. Co., New Bedford, Mass.  
National Twist Drill & Tool Co., & Winter Bros. Co., Rochester, Mich.  
Pratt & Whitney, West Hartford 1, Conn.  
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.  
Union Twist Drill Co., Athol, Mass.  
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

### REAMING MACHINES

Barnes Drill Co., 814 Chestnut St., Rockford, Ill.  
Greaves Machine Tool Co., 2009 Eastern Ave., Cincinnati, Ohio.  
Kaufman Manufacturing Co., Manitowoc, Wis.  
Magna Engineering Corp., 110 Linfield Drive, Menlo Park, Calif.  
Pratt & Whitney, West Hartford 1, Conn.  
Van Norman Co., 3640 Main St., Springfield 7, Mass.

### RECORDING INSTRUMENTS for Counting

National Acme Co., 170 E. 131st St., Cleveland, Ohio.

### RECTIFIERS

Federal Telephone & Radio Corp., E. Newark, N. J.

### REELS, Stock, Standard and Automatic

Nilson, A. H., Mch. Co., 1506 Railroad Ave., Bridgeport, Conn.  
U. S. Tool Co., Inc., 255 North 18th St., Amper, N. J.

### REFRACTORIES, Heat-Treating Furnace

Norton Co., 1 New Bond St., Worcester 6, Mass.

### REGULATORS, Temperature

Air Conversion Research Corp., 4107 N. Damen Ave., Chicago 18, Ill.  
General Electric Co., Schenectady, N. Y.

### REMOVERS, Japan, Enamel, Etc.

Oakite Products, Inc., 19 Rector St., New York, N. Y.

### RETAINING RINGS FOR BEARINGS, Etc.

Nice Ball Bearing Co., Nicetown, Philadelphia, Pa.  
Walder-Kohinoor, Inc., 4716 Austel Place, Long Island City 1, N. Y.

### RHEOSTATS

Allen-Bradley Co., 1326 S. 2nd St., Milwaukee, Wis.  
General Electric Co., Schenectady, N. Y.  
Westinghouse Electric Corp., Pittsburgh 30, Pa.

### RIVET SETS

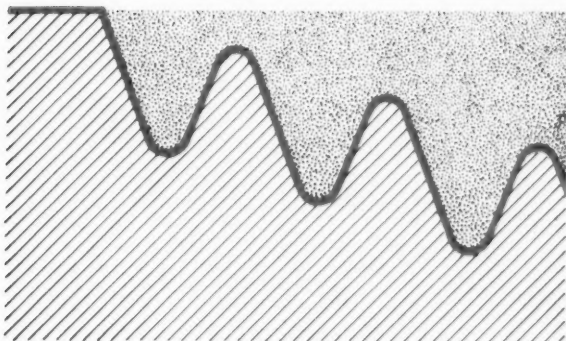
Bethlehem Steel Co., Bethlehem, Pa.  
Cleco Div., Reed Roller Bit Co., 5125 Clinton Ave., Houston 20, Texas.  
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.  
Peck, Stow & Wilcox Co., Southington, Conn.  
Thor Power Tool Co., Aurora, Ill.

### RIVETERS, Hydraulic

Bethlehem Steel Co., Bethlehem, Pa.  
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.

(Continued on page 424)

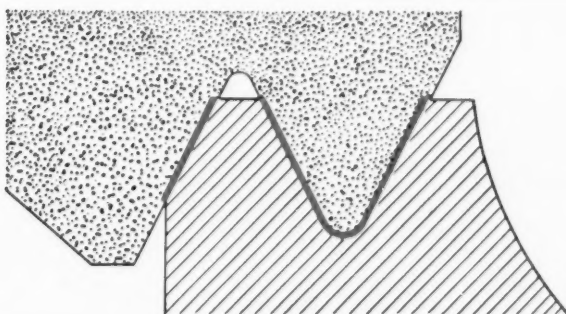
# Key to Accurate, Fast Contour Grinding . . . A HOGLUND Automatic or Manual Dresser



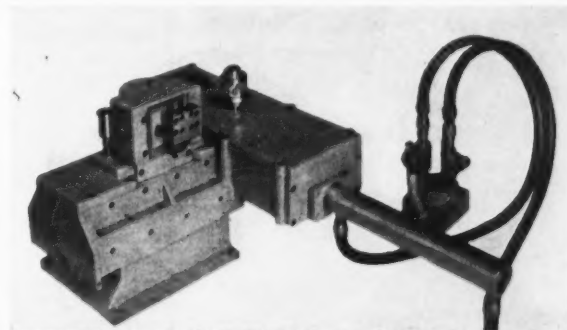
**Pine-tree form** at base of jet-engine bucket has a combination of convex and concave surfaces difficult to put into a grinding wheel—without the Hoglund Model-7B Dresser.



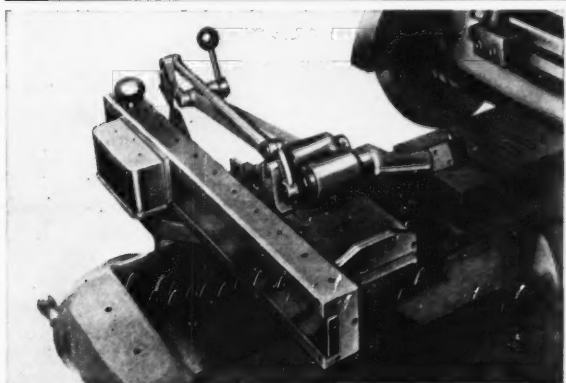
Automatic and electric-motor powered, the Model 7-B eliminates all skill in dressing. Two circular cams move the diamond across and into the wheel, providing a very compact unit. It is being used on the Thompson double-wheel bucket and blade grinder.



**Compressor-blade root form** has extremely close tolerances. A Model-32 Hoglund Dresser mounted on a Thompson Surface Grinder provided the high degree of accuracy and perfect blending of radius and tangent needed.



The hydraulic automatic Model-32 dresses in one continuous, smooth movement across the wheel. Diamond movement is reduced from the magnified contour template by inclined planes—there is no pantograph linkage.



**Three-inch-wide wheels** can be handled by our newest model, the KB11-3 manual dresser. It will fit on any horizontal surface grinder—and will dress any contour, no matter how complex, that can be entered by the diamond.

We make over 40 models, both special and regular, for surface, cylindrical and gear grinding machines. They all share four common features: (1) Pantograph linkage eliminated, usually by inclined planes. (2) Wheel dressed in one continuous operation. (3) Compactness and light weight. (4) A microscope fixture for precise setting of the diamonds in their holders.

**Send us your blueprints and have us submit our recommendations.**

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**ENGINEERING & MANUFACTURING CO.**  
**Berkeley Heights New Jersey**

## HANSELL-ELCOCK for Structure Controlled GRAY IRON CASTINGS

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Hanna Engineering Works, 1752 Elston Ave., Chicago, Ill.  
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.  
Morgan Engrg. Co., Alliance, Ohio.  
Wood, R. D. Co., Public Ledger Bldg., Philadelphia 5, Pa.

### RIVETERS, Pneumatic

Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.  
Cleco Div., Reed Roller Bit Co., 5125 Clinton Ave., Houston 20, Texas.  
Grant Mfg. & Machine Co., 90 Silliman St., Bridgeport 5, Conn.  
Ingersoll-Rand Co., Phillipsburg, N. J.  
Keller Tool Co., Grand Haven, Mich.  
Ryerson Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.  
Thor Power Tool Co., Aurora, Ill.

### RIVETING MACHINES

Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.  
Grant Mfg. & Machine Co., 90 Silliman St., Bridgeport 5, Conn.  
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.  
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.  
Tomkins-Johnson Co., Jackson, Mich.

### RIVET MAKING MACHINES

Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.  
National Machinery Co., Greenfield and Stanton Sts., Tiffin, Ohio.

### RUBBER PRODUCTS

Garlock Packing Co., Palmyra, N. Y.

### RULES, Steel

Brown & Sharpe Mfg. Co., Providence, R. I.  
Lufkin Rule Co., Hess Ave., Saginaw, Mich.  
Millers Falls Co., Greenfield, Mass.  
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.  
Starrett, The L. S. Co., Athol, Mass.

### RUST PREVENTIVES

Houghton, E. F. & Co., 303 W. Lehigh Ave., Philadelphia, Pa.  
Oakite Products, Inc., 19 Rector St., New York, N. Y.  
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

### SAND BLAST EQUIPMENT

See Blast Cleaning Equipment

### SANDERS

Black & Decker Mfg. Co., E. Penna. Ave., Towson, Md.  
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.  
Cleco Div., Reed Roller Bit Co., 5125 Clinton Ave., Houston 20, Texas.  
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.  
Ingersoll-Rand Co., Phillipsburg, N. J.  
Jarvis, Charles L., Co., Middletown, Conn.  
Keller Tool Co., Grand Haven, Mich.  
Millers Falls Co., Greenfield, Mass.  
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.  
Thor Power Tool Co., Aurora, Ill.  
United States Electrical Tool Div., Emerson Elec. Mfg. Co., 1050 Findlay St., Cincinnati 14, Ohio. Portable Electric.

### SAW BLADES, Hack

Armstrong-Blum Mfg. Co., 5700 W. Bloomingdale Ave., Chicago, Ill.  
Atkins Saw Div., Borg-Warner Corp., 402 South Illinois St., Indianapolis 9, Ind.  
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.  
Millers Falls Co., Greenfield, Mass.  
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.  
Starrett, The L. S. Co., Athol, Mass.  
Victor Saw Works, Inc., Middletown, N. Y.

### SAW SHARPENING MACHINES

Espen-Lucas Machine Works, Front St. and Girard Ave., Philadelphia, Pa.  
Motch & Merryweather Mchry. Co., Penton Bldg., Cleveland, Ohio.  
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

### SAWING MACHINES, Circular

Consolidated Mch. Tool Corp., Rochester, N. Y.  
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.  
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.  
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.  
Espen-Lucas Machine Works, Front St. and Girard Ave., Philadelphia, Pa.  
Motch & Merryweather Mchry. Co., Penton Bldg., Cleveland, Ohio.

### SAWING MACHINES, Friction

DoAll Co., 254 Laurel Ave., Des Plaines, Ill.  
Ryerson Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.  
Tannetitz Works, 315 Front St., N. W., Grand Rapids 2, Mich.

### SAWING MACHINES, Metal Cutting Band

Armstrong-Blum Mfg. Co., 5700 W. Bloomingdale Ave., Chicago, Ill.  
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.  
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.  
Fanco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.  
Grab Bros., Grafton, Wis.  
Ryerson Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.  
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.  
Tannetitz Works, 315 Front St., N. W., Grand Rapids 2, Mich.  
Walker-Turner Div., Kearney & Trecker Corp., South Ave., Plainfield, N. J.

### SAWING MACHINES, Power Hack

Armstrong-Blum Mfg. Co., 5700 W. Bloomingdale Ave., Chicago, Ill.  
Austin Industrial Corp., 76 Mamaroneck Ave., White Plains, N. Y.  
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.  
Ryerson Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.  
Thor Power Tool Co., Aurora, Ill.  
Victor Saw Works, Inc., Middletown, N. Y.

### SAWS, Circular Metal Cutting

Alina Corp., 401 Broadway, New York 13, N. Y. (Portable.)  
Atkins Saw Div., Borg-Warner Corp., 402 South Illinois St., Indianapolis 9, Ind.  
Brown & Sharpe Mfg. Co., Providence, R. I.  
Consolidated Mch. Tool Corp., Rochester, N. Y.  
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.  
Espen-Lucas Machine Works, Front St. and Girard Ave., Philadelphia, Pa.  
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.  
Illinois Tool Works, 2501 North Keeler Ave., Chicago, Ill.  
Motch & Merryweather Mchry. Co., Penton Bldg., Cleveland, Ohio.  
National Twist Drill & Tool Co., & Winter Bros., & Co., Rochester, Mich.  
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.  
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.  
Tannetitz Works, 315 Front St., N. W., Grand Rapids 2, Mich.  
Triplex Machine Tool Corp., 75 West St., New York 6, N. Y.  
Union Twist Drill Co., Athol, Mass.  
Walker-Turner Div., Kearney & Trecker Corp., 900 North Ave., Plainfield, N. J.

### SAWS, Metal Cutting Band

Armstrong-Blum Mfg. Co., 5700 W. Bloomingdale Ave., Chicago, Ill.  
Atkins Saw Div., Borg-Warner Corp., 402 South Illinois St., Indianapolis 9, Ind.  
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.  
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.  
Ryerson Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.  
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.  
Starrett, The L. S. Co., Athol, Mass.  
Tannetitz Works, 315 Front St., N. W., Grand Rapids 2, Mich.  
Walker-Turner Div., Kearney & Trecker Corp., 900 North Ave., Plainfield, N. J.

### SAWS, Portable Electric

Black & Decker Mfg. Co., E. Penna. Ave., Towson, Md.  
Millers Falls Co., Greenfield, Ohio.

### SAWS, Screw Slotting

Barber-Colman Co., Rock and Montague, Rockford, Ill.  
Brown & Sharpe Mfg. Co., Providence, R. I.  
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.  
Morse Twist Drill & Mch. Co., New Bedford, Mass.  
National Twist Drill & Tool Co., & Winter Bros. Co., Rochester, Mich.  
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.  
Starrett, The L. S. Co., Athol, Mass.  
Union Twist Drill Co., Athol, Mass.

(Continued on page 426)



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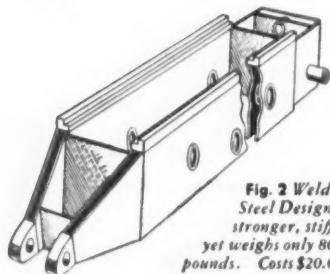
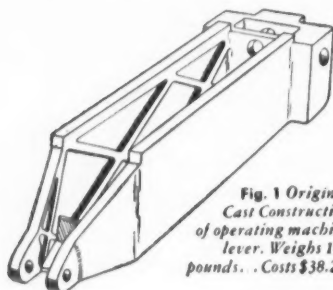
# DESIGN IN STEEL CUTS WEIGHT 48% LOWERS COST 52%

**P**ROPER design in welded steel can cut manufacturing costs an average of 50% on many products. In addition, steel designs are stronger, more rigid, can be fabricated with less material and fewer shop manhours.

The machine arm shown in figure 1 originally required 182 pounds of gray iron and cost \$38.25 to cast and machine.

By converting to welded steel construction the arm (Fig. 2) can be built for only \$20.06 and weighs but 86.8 pounds. Since steel is three times stronger and twice as rigid as gray iron, the wall sections of the steel design are  $\frac{3}{8}$ " plate instead of the original  $\frac{1}{2}$ " dimension. As a result, the weight saving is 48% which is particularly important because of inertia factors on this particular component.

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**THE LINCOLN ELECTRIC COMPANY**  
CLEVELAND 17, OHIO  
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## SCRAPERS, Hand and Power

Anderson Bros. Mfg. Co., 1910 Kishwaukee St., Rockford, Ill.

## SCREW DRIVERS, Power

Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.  
Cleco Div., Reed Roller Bit Co., 5125 Clinton Ave., Houston 20, Texas.  
Ingersoll-Rand Co., Phillipsburg, N. J.  
Keller Tool Co., Grand Haven, Mich.  
United States Electrical Tool Div., Emerson Elec. Mfg. Co., 1050 Findlay St., Cincinnati 14, Ohio.

## SCREW DRIVING AND NUT SETTING EQUIPMENT

Black & Decker Mfg. Co., E. Penna. Ave., Towson, Md.  
Cleco Div., Reed Roller Bit Co., 5125 Clinton Ave., Houston 20, Texas.  
Errington Mechanical Laboratory, Inc., 24 Norwood Ave., Stapleton, S. I., N. Y.  
Ingersoll-Rand Co., Phillipsburg, N. J.  
Jarvis, Charles L., Co., Middletown, Conn.  
Keller Tool Co., Grand Haven, Mich.  
Thor Power Tool Co., Aurora, Ill.

## SCREW MACHINE TOOLS AND EQUIPMENT

Bardons & Oliver, Inc., Ft. W. 9th St., Cleveland 13, Ohio.  
Brown & Sharpe Mfg. Co., Providence, R. I.  
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.  
Gorton Tool Co., 14400 Woodrow Wilson, Detroit, Mich.  
Greenlee Bros. & Co., 12th and Columbia Aves., Rockford, Ill.  
Millers Falls Co., Greenfield, Mass.  
National Acme Co., 170 E. 131st St., Cleveland.  
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.  
Potter & Johnston Co., 1027 Newport Ave., Pawtucket, R. I.  
R and L Tools, 1825 Bristol St., Philadelphia 40, Pa.  
Reed Rolled Thread Die Co., P. O. Box 350, Worcester 1, Mass.  
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

## SCREW MACHINE WORK

Aluminum Co. of America, Oliver Bldg., Pittsburgh, Pa.  
Eastern Mch. Screw Corp., New Haven, Conn.  
Morse Twist Drill & Mch. Co., New Bedford, Mass.  
National Acme Co., 170 E. 131st St., Cleveland.  
Otemiller, W. H., Co., York, Pa.  
Standard Pressed Steel Co., Jenkintown, Pa.  
Wicaco Machine Corp., Stenton Ave., and Loudon St., Philadelphia, Pa.

## SCREW MACHINES, Automatic Single and Multiple Spindle

Brown & Sharpe Mfg. Co., Providence, R. I.  
Cone Automatic Mch. Co., Inc., Windsor, Vt.  
Coso Corp., 405 Lexington Ave., New York 17, N. Y.  
Gorton, George, Mch. Co., 1110 W. 13th St., Racine, Wis.  
Greenlee Bros. & Co., 12th and Columbia Aves., Rockford, Ill.  
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.  
National Acme Co., 170 E. 131st St., Cleveland, Ohio.  
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.  
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.  
Schere, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.  
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

## SCREW MACHINES, Hand

### See also Lathes, Turret

Bardons & Oliver, Inc., Ft. W. 9th St., Cleveland 13, Ohio.  
Brown & Sharpe Mfg. Co., Providence, R. I.  
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.  
Hardinge Bros., Inc., 1418 College Ave., Elmira, N. Y.  
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.  
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.  
Simmons Mch. Tool Corp., 1600 N. Broadway, Albany, N. Y.  
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

## SCREW PLATES

Butterfield Div., Union Twist Drill Co., Derby Line, Vt.  
Card, S. W., Mfg. Co., Div. Union Twist Drill Co., Mansfield, Mass.  
Greenfield Tap & Die Corp., Greenfield, Mass.

Morse Twist Drill & Mch. Co., New Bedford, Mass.  
Pratt & Whitney, West Hartford 1, Conn.  
Winter Bros. Co., Rochester, Mich.

## SCREWS, Cap, Set, Safety Set and Machine, Etc.

Allen Mfg. Co., 133 Sheldon St., Hartford 2, Conn.  
Allied Products Corp., 12677 Burt Rd., Detroit 23, Mich.  
Chicago Screw Co., Bellwood, Ill.  
National Acme Co., 170 E. 131st St., Cleveland, Ohio.  
Otemiller, W. H., Co., York, Pa.  
Parker-Kalon Corp., 200 Varick St., New York 14, N. Y.  
Republic Steel Corp., Bolt & Nut Div., Republic Bldg., Cleveland 1, Ohio.  
Russell, Burdall & Ward Bolt & Nut Co., 100 Midland Ave., Port Chester, N. Y.  
Set Screw & Mfg. Co., 35 Main St., Bartlett, Ill.  
Standard Pressed Steel Co., Jenkintown, Pa.

## SCREWS, Self-tapping, Drive

Parker-Kalon Corp., 200 Varick St., New York 14, N. Y.

## SCREWS, Thumb

Northwestern Tool & Engrg. Co., 117 Hollier, Dayton, Ohio.  
Parker-Kalon Corp., 200 Varick St., New York 14, N. Y.  
Russell, Burdall & Ward Bolt & Nut Co., 100 Midland Ave., Port Chester, N. Y.

## SEALS AND RETAINERS, Oil or Grease

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Garlock Packing Co., Palmyra, N. Y.  
Gits Bros. Mfg. Co., 1846-62 Kilbourn Ave., Chicago, Ill.

## SECOND-HAND MACHINERY, Etc.

Eastern Machinery Co., 1006 Tennessee Ave., Cincinnati 22, Ohio.  
Miles Machinery Co., Box 770, Saginaw, Mich.  
Moray Mchry. Co., Inc., 410 Broome St., New York, N. Y.  
Simmons Mch. Tool Corp., 1600 N. Broadway, Albany, N. Y.

## SEPARATORS, Centrifugal

De Laval Separator Co., Poughkeepsie, N. Y.

## SEPARATORS, Oil or Coolant

Barnes Drill Co. (Magnetic), 814 Chestnut, Rockford, Ill.  
National Acme Co., 170 E. 131st St., Cleveland, Ohio.

## SHAFTING, Steel

Bethlehem Steel Co., Bethlehem, Pa.  
Cumberland Steel Co., Cumberland, Md.  
De Laval Separator Co., Poughkeepsie, N. Y.  
Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.  
LaSalle Steel Co., Hammond, Ind.  
Republic Steel Corp., Union Drawn Steel Div., Republic Bldg., Cleveland 1, Ohio.  
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.  
Summerill Tubing Co., Div. Columbia Steel & Shafting Co., P. O. Box 1557, Pittsburgh 30, Pa.

## SHAFTS

National Forge & Ordnance Co., Irvine, Warren County, Pa.  
Standard Pressed Steel Co., Jenkintown, Pa.  
Summerill Tubing Co., Div. Columbia Steel & Shafting Co., P. O. Box 1557, Pittsburgh 30, Pa.

## SHAFTS, Flexible

Jarvis, Chas. L., Co., Middletown, Conn.  
Precise Products Corp., 1328-30 Clark St., Racine, Wis.

## SHAFTS, Hollow-Bored

Bethlehem Steel Co., Bethlehem, Pa.

## SHAFTS, Turned and Ground

Bethlehem Steel Co., Bethlehem, Pa.  
Cumberland Steel Co., Cumberland, Md.  
Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.  
LaSalle Steel Co., Hammond, Ind.  
National Forge & Ordnance Co., Irvine, Warren County, Pa.  
Republic Steel Corp., Union Drawn Steel Div., Republic Bldg., Cleveland 1, Ohio.  
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.  
Summerill Tubing Co., Div. Columbia Steel & Shafting Co., P. O. Box 1557, Pittsburgh 30, Pa.

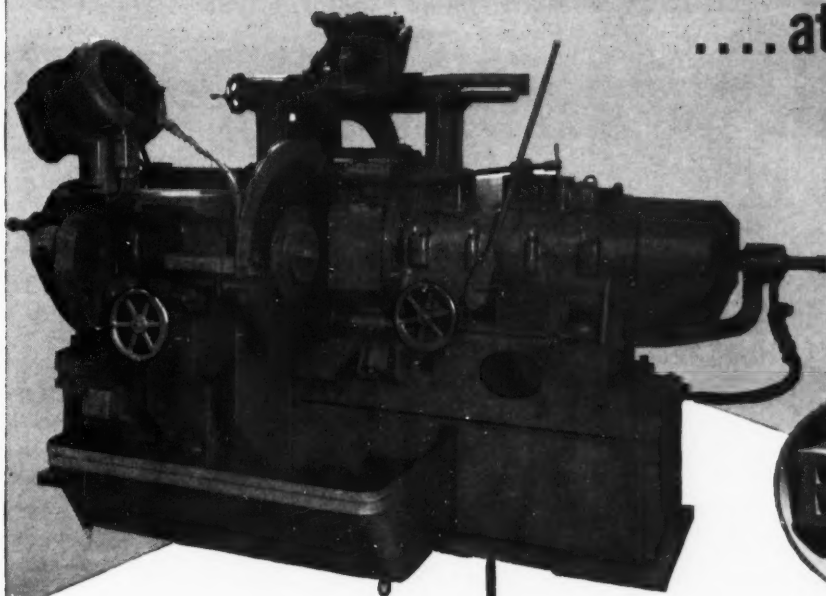
(Continued on page 428)

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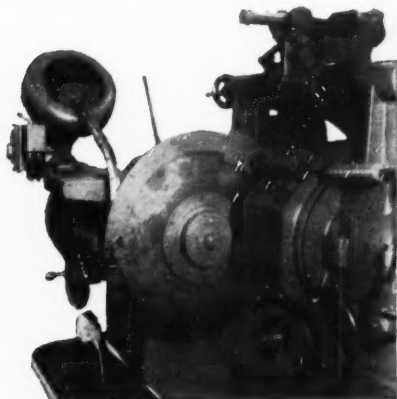
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Pieces  
Per Hour

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Hydraulic pump vanes are automatically hopper fed into a constantly rotating feed wheel, which has a series of openings to receive parts. As the feed wheel revolves, the pump vanes are carried between the parallel faces of the abrasive discs where two sides of the vanes are simultaneously ground. After grinding, the parts are automatically unloaded into a discharge pan.



## **No. 226 Double Spindle Wet Disc GRINDER**

High speed steel pump vanes which are used in the hydraulic pump of an automotive power steering unit are finish ground with this precision grinder . . . and at a rate of 750 pieces or 1500 surfaces an hour. Precision at production rates can be yours, too, because Besly Double Spindle Wet Disc Grinders can be easily adapted to grind many other parallel surfaced parts. Write for full information.



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REAMERS • BESLY-TITAN ABRASIVE WHEELS

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MACHINERY, September, 1953—427

**SHAPER-PLANERS**

Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.

**SHAPERS**

American Tool Works Co., Pearl and Eggleston Ave., Cincinnati, Ohio.  
Austin Industrial Corp., 76 Mamaroneck Ave., White Plains, N. Y.  
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.  
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.  
Hendey Machine Co., Inc., Torrington, Conn.  
Orsund Machine Works, Inc., 3940 Palmer St., Chicago, Ill.  
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.  
Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.  
Sheldon Mch. Co., Inc., 4240-4258 N. Knox Ave., Chicago 41, Ill.  
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.

**SHAPERS, Vertical**

Austin Industrial Corp., 76 Mamaroneck Ave., White Plains, N. Y.  
Pratt & Whitney, West Hartford 1, Conn.  
Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.

**SHAPES, Cold Drawn Steel**

Columbia Steel & Shaping Co., P. O. Box 1557, Pittsburgh 30, Pa.  
Summerill Tubing Co., Div. Columbia Steel & Shaping Co., P. O. Box 1557, Pittsburgh 30, Pa.

**SHAPES, Structural**

Aluminum Co. of America, Oliver Bldg., Pittsburgh, Pa.  
Bethlehem Steel Co., Bethlehem, Pa.  
Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.  
U. S. Steel Corp. (Carnegie-Illinois Steel Corp. Div., Columbia Steel Co. Div., Tennessee Coal, Iron & R. R. Co., Div.), 436 7th Ave., Pittsburgh, Pa.

**SHEARING MACHINERY**

Bethlehem Steel Co., Bethlehem, Pa.  
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.  
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.  
Cleveland Crane & Engrg. Co., Wickliffe, Ohio.  
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.  
Consolidated Mch. Tool Corp., Rochester, N. Y.  
Ferracuti Machine Co., Bridgeton, N. J.  
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.  
Morgan Engrg. Co., Alliance, Ohio.  
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.  
O'Neil-Irwin Mfg., Lake City, Minn.  
Peck, Stow & Wilcox Co., Southington, Conn.  
Ryerson, Jos. T. & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.  
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.  
Yoder Corp., 550 Walworth Ave., Cleveland, Ohio.

**SHEARS, Alligator**

Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.

**SHEARS, Rotary**

Bliss, E. W., Co., 1375 Raff Rd., S. W., Canton, Ohio.  
Brown & Sharpe Mfg. Co., Providence, R. I.  
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.  
Consolidated Mch. Tool Corp., Rochester, N. Y.  
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.  
Peck, Stow & Wilcox Co., Southington, Conn.  
Ryerson, Jos. T. & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.  
Simonds Saw & Steel Co. (Knives), 470 Main St., Fitchburg, Mass.  
Union Twist Drill Co., Athol, Mass.

**SHEARS, Squaring**

Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.  
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.  
Columbia Machinery & Engrg. Corp., Hamilton 1, Ohio.  
Consolidated Mch. Tool Corp., Rochester, N. Y.  
Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.  
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.  
Peck, Stow & Wilcox Co., Southington, Conn.  
Simonds Saw & Steel Co. (Blades), 470 Main St., Fitchburg, Mass.

**SHEET METALS**

Aluminum Co. of America, Oliver Bldg., Pittsburgh, Pa.  
American Brass Co., 25 Broadway, New York, N. Y.  
Bethlehem Steel Co., Bethlehem, Pa.  
Chase Brass & Copper Co., Inc., 1949 Rodney St., Waterbury 20, Conn.  
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.  
Ryerson, Jos. T. & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.  
U. S. Steel Corp. (Carnegie-Illinois Steel Corp. Div., Columbia Steel Co. Div., Tennessee Coal, Iron & R. R. Co., Div.), 436 7th Ave., Pittsburgh, Pa.

**SHEETS, Iron and Steel**

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.  
Bethlehem Steel Co., Bethlehem, Pa.  
Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.  
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.  
Ryerson, Jos. T. & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.  
U. S. Steel Corp. (Carnegie-Illinois Steel Corp. Div., Columbia Steel Co. Div., Tennessee Coal, Iron & R. R. Co., Div.), 436 7th Ave., Pittsburgh, Pa.

**SHIMS**

Laminated Shim Co., Inc., Glenbrook, Conn.

**SLEEVES**

Beaver Tool & Engineering Corp., 2850 Rochester Rd., Box 429, Royal Oak, Mich.  
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.  
Greenfield Tap & Die Corp., Greenfield, Mass.  
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.  
Morse Twist Drill & Mch. Co., New Bedford, Mass.  
National Twist Drill & Tool Co., Rochester, Mich.  
Pratt & Whitney, West Hartford 1, Conn.  
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.  
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.  
Union Twist Drill Co., Athol, Mass.

**SLOTING MACHINES**

Baker Bros., Inc., Station F, P. O. Box 101, Toledo 10, Ohio.  
Consolidated Mch. Tool Corp., Rochester, N. Y.  
Laddell United Co., 2000 "G" St., Wilmington 99, Del.  
Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.

**SOCKETS**

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.  
Chicago-Latrobe Twist Drill Wks., 411 W. Ontario St., Chicago, Ill.  
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.  
Greenfield Tap & Die Corp., Greenfield, Mass.  
Morse Twist & Drill Mch. Co., New Bedford, Mass.  
National Twist Drill & Tool Co., Rochester, Mich.  
Pratt & Whitney, West Hartford 1, Conn.  
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.  
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.  
Union Twist Drill Co., Athol, Mass.

**SPECIAL MACHINERY AND TOOLS**

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.  
Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.  
Barnes Drill Co., 814 Chestnut, Rockford, Ill.  
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.  
Bath, Cyril, Co., 6984 Machinery Ave., Cleveland 3, Ohio.  
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.  
Beaver Tool & Engineering Corp., 2850 Rochester Rd., Box 429, Royal Oak, Mich.  
Bethlehem Steel Co., Bethlehem, Pa.  
Bilgram Gear & Mch. Works, 1217-35 Spring Garden St., Philadelphia, Pa.  
Birdsboro Steel Fdy. & Mch. Co., Birdsboro, Pa.  
Blanchard Mch. Co., 64 State St., Cambridge, Mass.  
Bliss, E. W., Co., 1375 Raff Rd., S. W., Canton, Ohio.  
Chambersburg Engrg. Co., Chambersburg, Pa.  
Colonial Broach Co., Detroit 13, Mich.  
Columbus Die-Tool & Mch. Co., 955 Cleveland Ave., Columbus, Ohio.

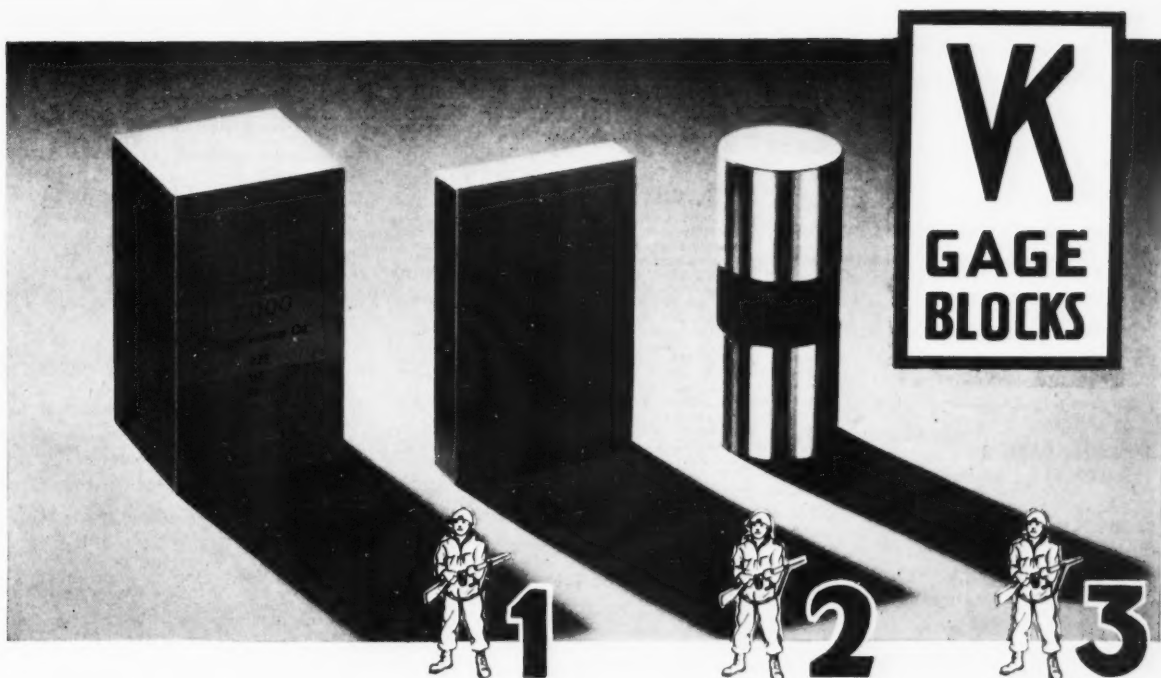
Consolidated Mch. Tool Corp., Rochester, N. Y.  
Coulter, James, Machine Co., 619 Railroad Ave., Bridgeport 5, Conn.  
Douglas Tool Co., 2300 E. Nine Mile Rd., Hazel Park, Mich.  
Espin-Lucas Mch. Works, Front St. and Girard Ave., Philadelphia, Pa.  
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.  
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.  
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.  
Forney's Inc., P. O. Box N310, New Castle, Pa.  
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.  
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.  
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.  
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.  
Grant Mfg. & Mch. Co., 90 Silliman St., Bridgeport 5, Conn.  
Greenlee Bros. & Co., 12th and Columbia Aves., Rockford, Ill.  
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago.  
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.  
Hill Acme Co., 1201 W. 65th St., Cleveland 2.  
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.  
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.  
Jahn, B. Manufacturing Co., Ellis St., New Britain, Conn.  
Kingsbury Mch. Tool Corp., Keene, N. H.  
Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.  
Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo.  
Lipe-Railway Corp., 806 Emerson Ave., Syracuse, N. Y.  
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.  
Modern Industrial Engrg. Co., 14230 Birwood, Detroit 4, Mich.  
Moline Tool Co., 102 20th St., Moline, Ill.  
Morgan Engrg. Co., Alliance, Ohio.  
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.  
Motch & Merryweather Mchry. Co., Penton Bldg., Cleveland, Ohio.  
National Acme Co., 170 E. 131st St., Cleveland, Ohio.  
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.  
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.  
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.  
National Twist Drill & Tool Co., Rochester, Mich.  
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.  
New England Mch. & Tool Co., Berlin, Conn.  
New Jersey Gear & Mfg. Co., 1470 Chestnut Ave., Hillside, N. J.  
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.  
Oilgear Co., 1560 W. Pierce St., Milwaukee 4.  
Pioneer Engrg. & Mfg. Co., 19679 John R St., Detroit, Mich.  
Pioneer Pump & Mfg. Co., 19679 John R St., Detroit, Mich.  
Pratt & Whitney, West Hartford 1, Conn.  
Precise Products Corp., 1328-30 Clark St., Racine, Wis.  
Reed-Prentice Corp., 677 Cambridge St., Worcester, Mass.  
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.  
Seneca Falls Mch. Co., Seneca Falls, N. Y.  
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.  
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.  
Taft-Peircie Mfg. Co., Woonsocket, R. I.  
Turchan Follower Mch. Co., 8259 Livernais & Alaska Aves., Detroit, Mich.  
Turner Bros., Inc., 2625 Hilton Rd., Ferndale 20, Mich.  
Union Twist Drill Co., Athol, Mass.  
Universal Engrg. Co., Frankennuth 2, Mich.  
V & O Press Co., Div. Emhart Mfg. Co., Hudson, N. Y.  
Waltham Machine Works, Newton St., Waltham, Mass.  
Wicaco Machine Corp., Stenton Ave. and Loudon St., Philadelphia, Pa.  
Zager Tool Co., 24000 Lakeland Blvd., Cleveland 23, Ohio.

**SPEED REDUCERS**

Atlantic Gear Works, Inc., 200 Lafayette St., New York 12, N. Y.  
Boston Gear Works, 3200 Main St., North Quincy 71, Mass.  
Brad Foote Gear Works, 1309 S. Cicero Ave., Cicero 50, Ill.  
Cleveland Worm & Gear Co., 3249 E. 80th St., Cleveland, Ohio.

(Continued on page 430)





## SOLDIERS THREE . . . *defending production accuracy*

To meet the requirements of the current defense effort in meeting closest limits of accuracy and protecting production, Van Keuren is currently furnishing three types of gage blocks:

- 1—SOLID SQUARE MASTER BLOCKS**
- 2—RECTANGULAR REFERENCE GAGES**
- 3—MICROGAGES**

Shipment on complete sets of any of these three types can be made within 60 days from receipt of order.

VK Solid Square Master Blocks are accurate to .000004" per inch of length and are designed for laboratory use or to standardize all shop dimensions. Large wearing surface; perfect parallelism. Available in 85- and 41-block sets and guaranteed unconditionally for 5 years not to exceed .0001" in wear.

VK Rectangular Reference Gages are guaranteed accurate to .000008" per inch of length and are designed for the inspection department or precision set-up work. They are available in 81-block and

33-block sets. Individual blocks from either of these sets can also be furnished. Certificate of size is also furnished with each set.

VK Microgages are accurate to plus .000012", minus .000008" per inch of length and are designed as working gages for shop use—to put accuracy at the machine. Wearing surface is 40% greater than that of rectangular gage blocks, hence their long-wearing quality. Available in several set combinations.

Van Keuren Gage Blocks are fully described in Catalog and Handbook No. 35, yours for the asking by writing: The Van Keuren Co., 178 Waltham St., Watertown, Mass.



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**178 WALTHAM STREET, WATERTOWN, MASS.**

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Cemented Carbide Plug Gages • Carboloy Cemented Carbide Measuring Wires





Cone-Drive Gears, Div. Michigan Tool Co., 7171 E. Michichols Rd., Detroit 12, Mich.  
Farrei-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.  
General Electric Co., Schenectady, N. Y.  
James, D. O. Gear Mfg. Co., 1140 W. Monroe St., Chicago 7, Ill.  
Link-Belt Co., 2045 W. Huntington Park Ave., Philadelphia 40, Pa.  
Ohio Gear Co., 1333 E. 179th St., Cleveland, Ohio.  
Perkins Mch. & Gear Co., Box 1611, Springfield 2, Mass.  
Philadelphia Gear Works, Inc., Erie Ave. and G St., Philadelphia, Pa.  
Twin Disc Clutch Co., 1361 Racine St., Racine, Wis.  
Westinghouse Electric Corp., Pittsburgh 30, Pa.

#### SPINDLES, Grinding

Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.  
Pope Mchry. Corp., Haverhill, Mass.  
Precise Products Corp., 1328-30 Clark St., Racine, Wis.  
Taft-Peirce Mfg. Co., Woonsocket, R. I.

#### SPINNING LATHES

See Chucking Machines.

#### SPROCKET CHAINS

Atlantic Gear Works, Inc., 200 Lafayette St., New York 12, N. Y.  
Boston Gear Works, 3200 Main St., North Quincy 71, Mass.  
Link-Belt Co., 220 S. Belmont Ave., Indianapolis 6, Ind.  
Ohio Gear Co., 1333 E. 179th St., Cleveland, Ohio.  
Philadelphia Gear Works, Inc., Erie Ave. and G St., Philadelphia, Pa.

#### SPROCKETS

Amgears, Inc., 6633 W. 65th St., Chicago 38, Ill.  
Atlantic Gear Works, Inc., 200 Lafayette St., New York 12, N. Y.  
Boston Gear Works, 3200 Main St., North Quincy 71, Mass.  
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.  
Link-Belt Co., 220 S. Belmont Ave., Indianapolis 6, Ind.  
Ohio Gear Co., 1333 E. 179th St., Cleveland, Ohio.  
Philadelphia Gear Works, Inc., Erie Ave. and G St., Philadelphia, Pa.  
Stahl Gear & Mch. Co., 3901 Hamilton Ave., Cleveland 14, Ohio.

#### STAMPINGS, All Metal

LaSalle Steel Co., Hammond, Ind.  
Mullins Manufacturing Corp., Salem, Ohio.

#### STAMPINGS, Sheet Metal

Aluminum Co. of America, Oliver Bldg., Pittsburgh, Pa.  
Laminated Shim Co., Inc., Glenbrook, Conn.  
Mullins Manufacturing Corp., Salem, Ohio.  
Republic Steel Corp., Niles Steel Products Div., Republic Bldg., Cleveland 1, Ohio.  
Revere Copper & Brass Inc., 230 Park Ave., New York, N. Y.

#### STAMPS, Steel and Marking Dies

Hoggson & Pettis Mfg. Co., 149 Brewery St., New Haven, Conn.  
Numerrall Stamp & Tool Co., Staten Island, N. Y.

#### STEEL

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.  
American Steel & Wire Co., Div. U. S. Steel Corp., Rockefeller Bldg., Cleveland, Ohio.  
Bethlehem Steel Co., Bethlehem, Pa.  
Carpenter Steel Co., Reading, Pa.  
Crucible Steel Co. of America, Chrysler Bldg., New York, N. Y.  
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.  
Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.  
National Forge & Ordnance Co., Irvine, Warren County, Pa.  
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.  
Ryerson, Jos. T. & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.  
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.  
Summerill Tubing Co., Div. Columbia Steel & Shaffing Co., P. O. Box 1557, Pittsburgh 30, Pa.

Timken Roller Bearing Co., Canton, Ohio.  
U. S. Steel Corp. (American Steel & Wire Co. Div., Carnegie-Illinois Steel Corp. Div., Columbia Steel Co., Div. Tennessee Coal, Iron & R. R. Co. Div.), 436 7th Ave., Pittsburgh, Pa.  
U. S. Steel Supply Div., U. S. Steel Co., 208 S. LaSalle St., Chicago 4, Ill.  
Wheelock-Lovejoy & Co., Inc., Cambridge, Mass.

#### STEEL, Cold Drawn

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.  
American Steel & Wire Co., Div. U. S. Steel Corp., Rockefeller Bldg., Cleveland, Ohio.  
Bethlehem Steel Co., Bethlehem, Pa.  
Crucible Steel Co. of America, Chrysler Bldg., New York, N. Y.  
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.  
Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.  
LaSalle Steel Co., Hammond, Ind.  
Republic Steel Corp., Union Drawn Steel Div., Massillon, Ohio.  
Ryerson, Jos. T. & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.  
Summerill Tubing Co., Div. Columbia Steel & Shaffing Co., P. O. Box 1557, Pittsburgh 30, Pa.  
Timken Roller Bearing Co., Canton, Ohio.  
U. S. Steel Corp. (American Steel & Wire Co. Div.), 436 7th Ave., Pittsburgh, Pa.  
Wheelock-Lovejoy & Co., Inc., Cambridge, Mass.

#### STEEL, High Speed Tool

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.  
Armstrong Bros. Tool Co., 5200 Armstrong Ave., Chicago, Ill.  
Bethlehem Steel Co., Bethlehem, Pa.  
Carpenter Steel Co., Reading, Pa.  
Crucible Steel Co. of America, Chrysler Bldg., New York, N. Y.  
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.  
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.  
Ryerson, Jos. T. & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.  
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.  
Vanadium Alloys Steel Co., Latrobe, Pa.  
Wheelock-Lovejoy & Co., Inc., Cambridge, Mass.

#### STEEL, Machine

Bethlehem Steel Co., Bethlehem, Pa.  
Carpenter Steel Co., Reading, Pa.  
Crucible Steel Co. of America, Chrysler Bldg., New York, N. Y.  
Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.  
LaSalle Steel Co., Hammond, Ind.  
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.  
Ryerson, Jos. T. & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.  
Timken Roller Bearing Co., Canton, Ohio.  
Wheelock-Lovejoy & Co., Inc., Cambridge, Mass.

#### STEEL, Stainless

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.  
American Steel & Wire Co., Div. U. S. Steel Corp., Rockefeller Bldg., Cleveland, Ohio.  
Bethlehem Steel Co., Bethlehem, Pa.  
Carpenter Steel Co., Reading, Pa.  
Crucible Steel Co. of America, Chrysler Bldg., New York, N. Y.  
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.  
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.  
Ryerson, Jos. T. & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.  
Timken Roller Bearing Co., Canton, Ohio.  
U. S. Steel Corp. (American Steel & Wire Co. Div., Carnegie-Illinois Steel Corp. Div.), 436 7th Ave., Pittsburgh, Pa.  
Wheelock-Lovejoy & Co., Inc., Cambridge, Mass.

#### STEEL, Strip and Sheet

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.  
American Steel & Wire Co., Div. U. S. Steel Corp., Rockefeller Bldg., Cleveland, Ohio.  
Bethlehem Steel Co., Bethlehem, Pa.  
Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.  
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.  
Ryerson, Jos. T. & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.  
U. S. Steel Corp. (American Steel & Wire Co. Div., Carnegie-Illinois Steel Corp. Div., Columbia Steel Co. Div., Tennessee Coal, Iron & R. R. Co. Div.), 436 7th Ave., Pittsburgh, Pa.

#### STEEL, Tool and Die

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.  
Carpenter Steel Co., Reading, Pa.  
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.  
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.  
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.  
Vanadium Alloys Steel Co., Latrobe, Pa.

#### STEEL, Zinc, Tin and Copper Coated Strip

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.

#### STEEL ALLOYS

See Alloys, Steel.

#### STEEL BARS

See Bars, Steel.

#### STEEL STOCK GROUND FLAT

Brown & Sharpe Mfg. Co., Providence, R. I.  
Starrett, The L. S., Co., Athol, Mass.  
Summerill Tubing Co., Div. Columbia Steel & Shaffing Co., P. O. Box 1557, Pittsburgh 30, Pa.

#### STELLITE

Haynes Stellite Div., Union Carbide & Carbon Corp. (Alloy), 30 E. 42nd St., New York, N. Y.

#### STOCKS, Die

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.  
Butterfield Div., Union Twist Drill Co., Derby Line, Vt.  
Card, S. W., Mfg. Co., Div. Union Twist Drill Co., Mansfield, Mass.  
Greenfield Tap & Die Corp., Greenfield, Mass.  
Morse Twist Drill & Mch. Co., New Bedford, Mass.  
Pratt & Whitney, West Hartford 1, Conn.  
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.

#### STONES, Oil or Sharpening

Bay State Abrasive Co., Westboro, Mass.  
Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.  
Norton Co., 1 New Bond St., Worcester 6, Mass.

#### STOOLS

Standard Pressed Steel Co., Jenkintown, Pa.

#### STRAIGHTEDGES

Starrett, The L. S., Co., Athol, Mass.  
Taft-Peirce Mfg. Co., Woonsocket, R. I.

#### STRAIGHTENERS, Flat Stock and Wire

Nilson, A. H., Mch. Co., 1506 Railroad Ave., Bridgeport, Conn.  
U. S. Tool Co., Inc., 255 North 18th St., Amper, N. J.

#### STRAIGHTENING MACHINERY

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.  
Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.  
Chambersburg Engrg. Co., Chambersburg, Pa.  
Colonial Broach Co., Detroit 13, Mich.  
Consolidated Mch. Tool Corp., Rochester, N. Y.  
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.  
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.  
Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.  
Morse Twist Drill & Mch. Co., New Bedford, Mass.  
Oilgear Co., 1560 W. Pierce St., Milwaukee 4, Wis.  
Springfield Mch. Tool Co., Springfield, Ohio.  
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

#### STUD SETTERS

Errington Mechanical Laboratory Inc., 24 Norwood Ave., Stapleton, S. I., N. Y.  
Procurier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.

#### SUB-PRESSES

Waltham Machine Works, Newton St., Waltham, Mass.

#### SUPERFINISHING MACHINES

Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.

(Continued on page 432)

WHAT DOES FIRTH STERLING OFFER YOU?

(ANSWER NUMBER 3)

# UNBIASED RECOMMENDATIONS

Producing *tools* and *tool materials* for the cutting, shaping and forming of metals is *major* business at Firth Sterling. Hence, capacity to serve you best necessarily embraces "full line tooling" . . . high speed tool steels *and* tungsten carbides, or *both* as needed.

So, you can count on *unbiased* tooling recommendations when you make Firth Sterling your *one* source of supply for *complete* shop tooling needs. We have *no* axes to grind!

What are the advantages to you?

1. An integrated tooling program that saves you money by matching tools to applications, without temptation to apply more expensive tools than may be necessary.
2. Improved production from wider selections. A choice of 97 different grades of high speed steels and tool and die steels *and* a dozen grades of carbides in everything from die nibs to an almost unlimited selection of standard and special carbide tools and tips.
3. The purchasing economies inherent to buying from one source of supply instead of from several.
4. The finest "packaged" tool line today for easy handling, stocking, identification in the tool crib, and inventory control.
5. The consistently high quality assured by 64 years of leadership in development of special purpose steels and 21 years of pioneering in carbide and powder metallurgy applications.

Makes sense, doesn't it? Call a Firth Sterling representative, or phone the nearest one of our 87 distributors.

**Firth Sterling Stands for Metallurgical Achievement—Past, Present, Future**

## Firth Sterling

— INC. —

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For more information on products advertised, use Inquiry Card, page 239

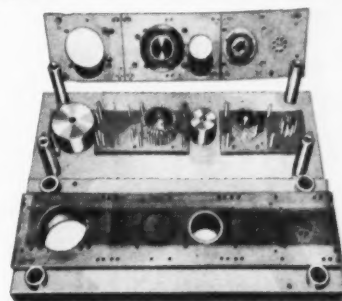
## A VERSATILE FAMILY OF *Tool and Die Steels.*

CROMOVAN • AIRVAN • INVARO

Certain steels or families of steel stand out as having almost universal application for general use, ranging from moderate to high production as job requirements demand. One such Firth Sterling family of steels consists of CROMOVAN, AIRVAN, and INVARO. CROMOVAN and AIRVAN are air hardening; INVARO is oil hardening.

### ANALYSES

|            | CROMOVAN | AIRVAN | INVARO |
|------------|----------|--------|--------|
| Carbon     | 1.60%    | 1.00%  | .90%   |
| Chromium   | 12.50%   | 5.25%  | .50%   |
| Vanadium   | 1.00%    | .25%   | .20%   |
| Molybdenum | 1.00%    | 1.15%  | —      |
| Manganese  | —        | —      | 1.15%  |
| Tungsten   | —        | —      | .50%   |



Generally speaking, CROMOVAN is intended for long production runs where hundreds of thousands or millions of pieces must be produced at minimum cost; AIRVAN for intermediate runs where toughness and high abrasion resistance are also requirements; INVARO, an oil hardening tool steel for all other general use.

Full technical details are available in these free bulletins. Write for them today or ask your Firth Sterling representative to call and discuss your tool and die needs . . . steel or carbide.



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High Speed Steels  
Tool & Die Steels  
Stainless Specialties  
High Temperature Alloys



Sintered Tungsten Carbides  
Firth Heavy Metal  
Chromium Carbides  
High Temperature Cermets

**SURFACE PLATES**

See Plates, Surface

**SWAGING MACHINES**

Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.  
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.  
Torrington Co., Torrington, Conn.

**SWITCHES**

Allen-Bradley Co., 1326 S. 2nd St., Milwaukee, Wis.  
Central Products, Inc., (Waterproof and Thermo), 306 Sussex St., Harrison, N. J.  
General Electric Co., Schenectady, N. Y.  
National Acme Co., 170 E. 131st St., Cleveland, Ohio.  
Westinghouse Electric Corp., Pittsburgh 30, Pa.

**TACHOMETERS**

Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.  
Veeder-Root, Inc., 20 Sargent St., Hartford, Conn.

**TAPER PINS, Standard**

Chicago Screw Co., Bellwood, Ill.  
Morse Twist Drill & Mch. Co., New Bedford, Mass.  
Pratt & Whitney, West Hartford 1, Conn.

**TAP HOLDERS**

Errington Mechanical Laboratory, Inc., 24 Norwood Ave., Stapleton, S. I., N. Y.  
McCrosky Tool Co., 1938 Thomas St., Meadville, Pa.  
Proconier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.  
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.

**TAPPING ATTACHMENTS AND DEVICES**

Avey Drilling Mach. Co., 26 E. Third St., Covington, Ky.  
Baker Bros., Inc., Station F, P. O. Box 101, Toledo 10, Ohio.  
Brown & Sharpe Mfg. Co., Providence, R. I.  
Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich.  
Errington Mechanical Laboratory, Inc., 24 Norwood Ave., Stapleton, S. I., N. Y.  
Etico Tool Co., Inc., 592 Johnson Ave., Brooklyn, N. Y.

Homestrand, Inc., Larchmont, N. Y.  
Jarvis, Chas. L., Co., Middletown, Conn.  
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.  
Magna Engineering Corp., 110 Linfield Drive, Menlo Park, Calif.  
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.  
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.  
Proconier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.  
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.  
Thriftmaster Products Corp., 1076 N. Plum St., Lancaster, Pa.

**TAPPING MACHINES**

Avey Drilling Mach. Co., 26 E. Third St., Covington, Ky.  
Baker Bros., Inc., Station F, P. O. Box 101, Toledo 10, Ohio.  
Barnes Drill Co., 814 Chestnut, Rockford, Ill.  
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.  
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.  
Bodine Corp., 317 Mt. Grove St., Bridgeport, Conn.  
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.  
Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich.  
Challenge Mchry. Co., Grand Haven, Mich.  
Cleveland Tapping Machine Co., Canton 6, Ohio.  
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.  
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.  
Greenlee Bros. & Co., 12th and Columbia Aves., Rockford, Ill.  
Hamilton Tool Co., 834 South 9th St., Hamilton, Ohio.  
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.  
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.  
Jarvis, Chas. L., Co., Middletown, Conn.  
Kaufman Manufacturing Co., Manitowoc, Wis.  
Kingsbury Mch. Tool Corp., Keene, N. H.  
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.  
Magna Engineering Corp., 110 Linfield Drive, Menlo Park, Calif.  
Moline Tool Co., 102 20th St., Moline, Ill.  
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.  
National Acme Co., 170 E. 131st St., Cleveland, Ohio.  
National Automatic Tool Co., Inc., S. 7th and N Sts., Richmond, Ind.  
Proconier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.  
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.

**TAPPING MACHINES, Nut**

Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.  
National Machinery Co., Greenfield and Stanton Sts., Tiffin, Ohio.  
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.

**TAPS**

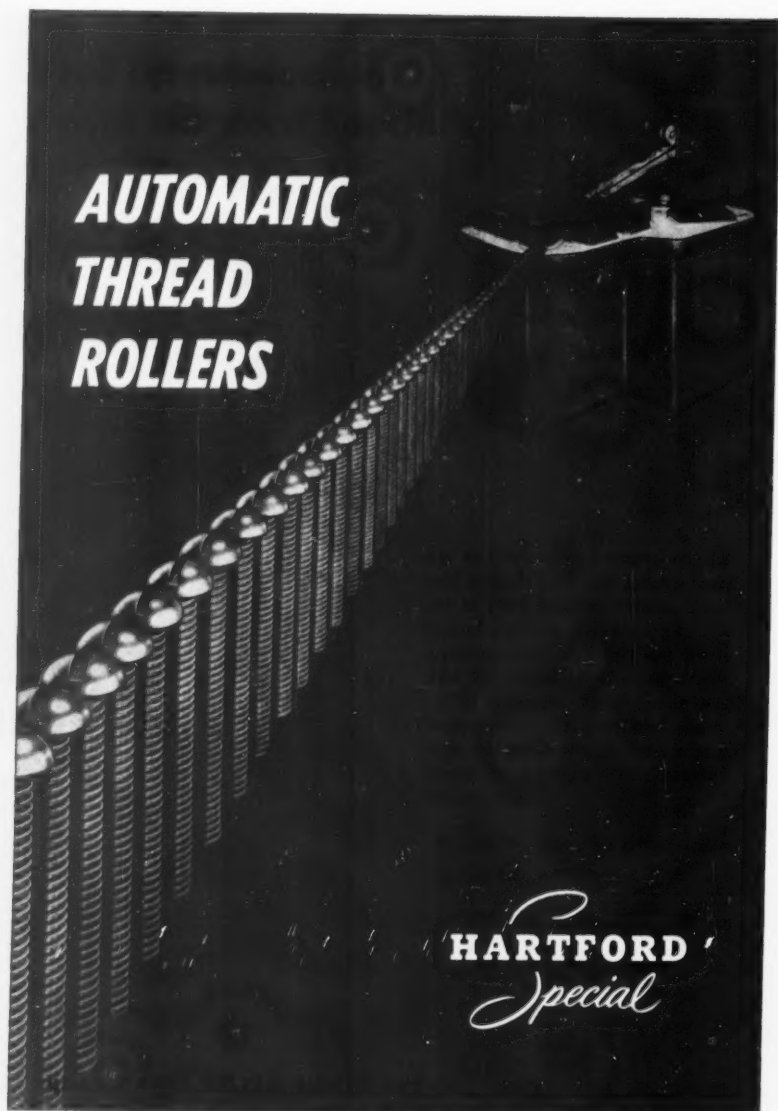
Besly-Welles Corp., Beloit, Wis.  
Butterfield Div., Union Twist Drill Co., Derby Line, Vt.  
Card, S. W., Mfg. Co., Div. Union Twist Drill Co., Mansfield, Mass.  
Continental Tool Works, Div. Ex-Cell-O Corp., Detroit 32, Mich.  
Detroit Tap & Tool Co., 8615 E. 8 Mile Rd., Base Line, Mich.  
Geometric Tool Co., Westville Station, New Haven 15, Conn.  
Greenfield Tap & Die Corp., Greenfield, Mass.  
Landis Mch. Co. (Solid Adjustable), Waynesboro, Pa.  
Morse Twist Drill & Mach. Co., New Bedford, Mass.  
Pratt & Whitney, West Hartford 1, Conn.  
Sheffield Corp., 721 Springfield, Dayton, Ohio.  
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.  
Winter Bros. Co., Rochester, Mich.  
Wood & Spencer Co., 1930 E. 61st St., Cleveland, Ohio.

**TAPS, Collapsing**

Geometric Tool Co., Westville Station, New Haven 15, Conn.  
Landis Mch. Co., Waynesboro, Pa.  
National Acme Co., 170 E. 131st St., Cleveland, Ohio.  
Sheffield Corp., 721 Springfield, Dayton, Ohio.

**THREAD CUTTING MACHINERY**

Brown & Sharpe Mfg. Co., Providence, R. I.  
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.  
Coulter, James, Machine Co., 629 Railroad Ave., Bridgeport 5, Conn.  
Davis & Thompson Co., 6411 W. Burnham St., Milwaukee 14, Wis.  
Eastern Mch. Screw Corp., New Haven, Conn.  
(Continued on page 434)



**AUTOMATIC  
THREAD  
ROLLERS**

**HARTFORD**  
*Special*



**GEROTOR**

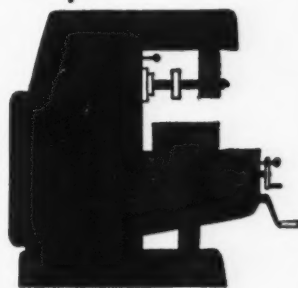
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MACHINERY, September, 1953—433



Fellows Gear Shaper Co., 78 River St., Springfield, Vt.  
 Grant Mfg. & Mch. Co., 90 Silliman St., Bridgeport 5, Conn.  
 Hall Planetary Co., Fox St. and Abbottsford Ave., Philadelphia 29, Pa.  
 Hanson-Whitney Co., Div. Whitney Chain Co., Hartford, Conn.  
 Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.  
 Kaufman Manufacturing Co., Manitowoc, Wis.  
 Landis Mch. Co., Waynesboro, Pa.  
 Magna Engineering Corp., 110 Linfield Drive, Menlo Park, Calif.  
 Pratt & Whitney, West Hartford 1, Conn.  
 Proconier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.  
 Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.  
 Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.  
 Tatt-Peirce Mfg. Co., Woonsocket, R. I.

**THREAD CUTTING TOOLS**

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.  
 Detroit Tap & Tool Co., 8615 E. 8 Mile Rd., Base Line, Mich.  
 Eastern Mch. Screw Corp., New Haven, Conn.  
 Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.  
 Fellows Gear Shaper Co., 78 River St., Springfield, Vt.  
 Geometric Tool Co., Westville Station, New Haven 15, Conn.  
 Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.  
 Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.  
 Landis Mch. Co., Waynesboro, Pa.  
 Pratt & Whitney, West Hartford 1, Conn.  
 Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.  
 Sheffield Corp., 721 Springfield, Dayton, Ohio.  
 Tatt-Peirce Mfg. Co., Woonsocket, R. I.  
 Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

**THREAD GAGES**

See Gages, Thread.

**THREAD GRINDING MACHINES**

See Grinding Machines, Thread.

**THREAD MILLING MACHINES**

Coulter, James, Machine Co., 629 Railroad Ave., Bridgeport 5, Conn.  
 Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.  
 Hall Planetary Co., Fox St. and Abbottsford Ave., Philadelphia 29, Pa.  
 Hanson-Whitney Co., Div. Whitney Chain Co., Hartford, Conn.  
 Pratt & Whitney, West Hartford 1, Conn.  
 Precise Products Corp., 1328-30 Clark St., Racine, Wis.  
 Sheffield Corp., 721 Springfield, Dayton, Ohio.  
 Waltham Machine Works, Newton St., Waltham, Mass.

**THREAD ROLLING MACHINES**

Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.  
 Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.  
 Reed Rolled Thread Die Co., P. O. Box 350, Worcester 1, Mass.  
 Salvo Tool & Engineering Co., 26441 Gratiot Ave., Roseville, Mich.  
 V & O Press Co., Div., Emhart Mfg. Co., Hudson, N. Y.

**TIN AND TERNEPLATES**

Bethlehem Steel Co., Bethlehem, Pa.  
 Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.  
 Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.  
 U. S. Steel Corp. (Carnegie-Illinois Steel Corp., Div., Columbia Steel Co. Div. Tennessee Coal, Iron & R. R. Co., Div.), 436 7th Ave., Pittsburgh, Pa.

**TOOL BITS, High Speed Steel**

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.  
 Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.  
 Carpenter Steel Co., Reading, Pa.  
 Crucible Steel Co. of America, Chrysler Bldg., New York, N. Y.  
 Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.  
 Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.  
 Illinois Tool Works, 2501 North Keeler Ave., Chicago, Ill.  
 Ryerson, Jos. T. & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.  
 Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.  
 Vanadium Alloys Steel Co., Latrobe, Pa.  
 Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.  
 Wheelock-Lovejoy & Co., Inc., Cambridge, Mass.

**TOOL BITS, Special Alloy**

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.  
 Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.  
 Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.  
 Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.  
 Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.  
 Kennametal, Inc., Latrobe, Pa.  
 Vanadium Alloys Steel Co., Latrobe, Pa.  
 Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

**TOOL GRINDERS**

See Grinding Machines for Sharpening, Turning and Planning Tools.

**TOOL GRINDING ATTACHMENTS**

Detroit Reamer & Tool Co., 2830 E. 7 Mile Rd., Detroit, Mich.

**TOOL HOLDERS**

Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.  
 Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.  
 Beaver Tool & Engineering Corp., 2850 Rochester Rd., Box 429, Royal Oak, Mich.  
 Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.  
 Eclipse Counterbore Co., 1600 Bonner Ave., Ferndale, Mich.

(Continued on page 436)

**HERE'S THE "tap miser" YOU'VE BEEN WAITING FOR!**

helps eliminate costly tap breakage shut-downs and excessive work spoilage!

Breaking too many taps?—Tap life shortened?—Spoiling many pieces?—Then check your tapping equipment. Investigate PROCUNIER Tapping attachments. Whether it's continuous or intermittent tapping in soft or hard metals—large or small hole jobs with skilled or unskilled operators—you will find Procunier Tapping machines performing with a new-found ease, a more dependable and consistent accuracy and providing many extra hours of tapping efficiency. Procunier Tappers are gentle to costly taps and tough on maintaining production schedules.

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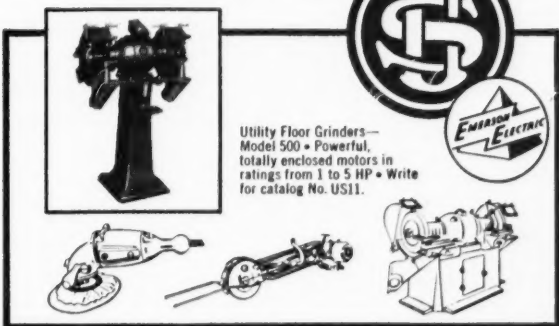
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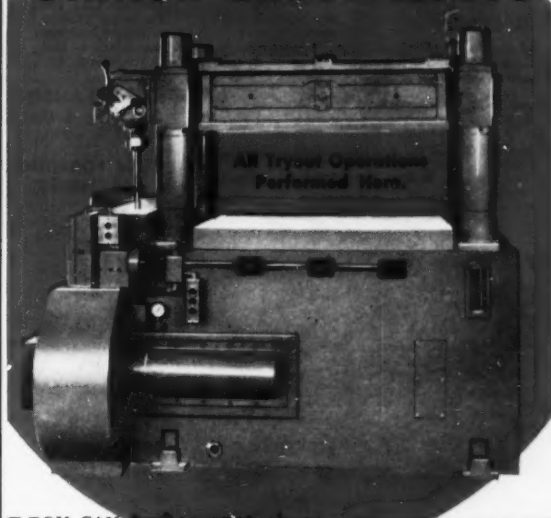
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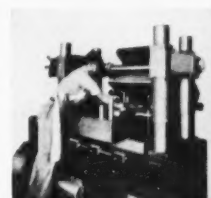
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open on all four sides, giving  
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Lovejoy Tool Co., Springfield, Vt.  
Maxwell Co., 420 Broadway, Bedford, Ohio.  
Michigan Tool Co., 7171 E. McNichols Rd.,  
Detroit, Mich.  
Miholland, W. K., Mchry. Co., 6402 Westfield  
Blvd., Indianapolis 5, Ind.  
OK Tool Co., Milford, N. H.  
Portage Double Quick Tool Co., 1063 Sweitzer  
Ave., Akron 11, Ohio.  
R and L Tools, 1825 Bristol St., Philadelphia  
40, Pa.  
Scully-Jones & Co., 1903 Rockwell St., Chi-  
cago 8, Ill. (Turret)  
South Bend Lathe Works, Inc., 425 E. Madison  
St., South Bend, Ind.  
Warner & Swasey Co., 5701 Carnegie Ave.,  
Cleveland 3, Ohio.  
Wesson Co., 1220 Woodward Heights Blvd.,  
Ferndale, Mich.  
Western Tool & Mfg. Co., 1640 Wheeler St.,  
Springfield, Ohio.

### TOOLMAKERS' INSTRUMENTS

Ames, B. C. Co., Waltham 54, Mass.  
Brown & Sharpe Mfg. Co., Providence, R. I.  
Scherr, George, Co., Inc., 200 Lafayette St.,  
New York 12, N. Y.  
Starrett, The L. S. Co., Athol, Mass.  
Taft-Peirce Mfg. Co., Woonsocket, R. I.

### TOOL STEEL

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.  
Bethlehem Steel Co., Bethlehem, Pa.  
Carpenter Steel Co., Reading, Pa.  
Crucible Steel Co. of America, Chrysler Bldg.,  
New York, N. Y.  
Firth Sterling Inc., 3113 Forbes St., Pittsburgh  
30, Pa.  
Republic Steel Corp., Republic Bldg., Cleveland  
1, Ohio.  
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St.,  
Chicago 18, Ill.  
Vanadium Alloys Steel Co., Latrobe, Pa.

### TOOLS, Carbide-Tipped

Adamas Carbide Corp., 999 South 4th St.,  
Harrison, N. J.  
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.  
Atrax Co., Newington, Conn.  
Beaver Tool & Engineering Corp., 2850 Roches-  
ter Rd., Box 429, Royal Oak, Mich.  
Carboloy Dept., General Electric Co., Box 237,  
Roosevelt Park Annex, Detroit 32, Mich.  
Chicago-Latrobe Twist Drill Works, 411 W.  
Ontario St., Chicago, Ill.  
Cleveland Twist Drill Co., 1242 E. 49th St.,  
Cleveland, Ohio.  
Colonial Broach Co., Detroit 13, Mich.  
Eclipse Counterbore Co., 1600 Bonner Ave.,  
Ferndale, Mich.  
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit  
32, Mich.  
Firth Sterling Inc., 3113 Forbes St., Pittsburgh  
30, Pa.  
Gairing Tool Co., 21225 Hoover Rd., Detroit  
32, Mich.  
Gorham Tool Co., 14400 Woodrow Wilson,  
Detroit, Mich.  
Illinois Tool Works, 2501 North Keeler Ave.,  
Chicago, Ill.  
Kennametal, Inc., Latrobe, Pa.  
Maxwell Co., 420 Broadway, Bedford, Ohio.  
McCroskey Tool Corp., 1938 Thomas St., Mead-  
ville, Pa.  
Metal Carbides Corp., Youngstown, Ohio.  
Morse Twist Drill & Mch. Co., New Bedford,  
Mass.  
OK Tool Co., Milford, N. H.  
Precision Products Corp., 1328-30 Clark St.,  
Racine, Wis.  
Super Tool Co., 21650 Hoover Rd., Detroit 13,  
Mich.  
Union Twist Drill Co., Athol, Mass.  
Wesson Metal Corp., Lexington, Ky.  
Whitman & Barnes, 40600 Plymouth Rd.,  
Plymouth, Mich.  
Willey's Carbide Tool Co., 1340 W. Vernor  
Hwy., Detroit 1, Mich.

### TOOLS, Lathe, Shaper and Planer

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.  
Apex Tool & Cutter Co., Inc., 237 Canal St.,  
Shelton, Conn.  
Armstrong Bros. Tool Co., 5200 W. Armstrong  
Ave., Chicago, Ill.  
Bullard Co., Brewster St., Bridgeport 2, Conn.  
Carboloy Dept., General Electric Co., Box 237,  
Roosevelt Park Annex, Detroit 32, Mich.  
Firth Sterling Inc., 3113 Forbes St., Pittsburgh  
30, Pa.  
Gorham Tool Co., 14400 Woodrow Wilson,  
Detroit, Mich.  
Haynes Stellite Div., Union Carbide & Carbon  
Corp., 30 E. 42nd St., New York, N. Y.  
Kennametal, Inc., Latrobe, Pa.  
Lovejoy Tool Co., Springfield, Vt.  
Northwestern Tool & Engrg. Co., 117 Hollier,  
Dayton, Ohio.

OK Tool Co., Milford, N. H.  
South Bend Lathe Works, Inc., 425 E. Madison  
St., South Bend, Ind.  
Super Tool Co., 21650 Hoover Road, Detroit 13,  
Mich.  
Turchan Follower Mch. Co., 8259 Livernois &  
Alaska Aves., Detroit, Mich.  
Wesson Co., 1220 Woodward Heights Blvd.,  
Ferndale, Mich.

### TRANSFER MACHINES, Automatic

Barnes Drill Co., 814 Chestnut St., Rockford,  
Ill.  
Barnes, W. F. & John, Co., 201 S. Water St.,  
Rockford, Ill.  
Colonial Broach Co., Detroit 13, Mich.  
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.  
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit  
32, Mich.  
Morris Machine Tool Co., Inc., 946-M Harriet  
St., Cincinnati 3, Ohio.  
Sundstrand Mch. Tool Co., 2531 11th St.,  
Rockford, Ill.

### TRANSFORMERS

General Electric Co., Schenectady, N. Y.

### TRANSMISSION, Variable Speed

Link-Belt Co., 2045 W. Huntington Park Ave.,  
Philadelphia 40, Pa.  
Oilgear Co., 1560 W. Pierce St., Milwaukee 4.  
Reliance Electric & Engrg. Co., 1047 Ivanhoe  
Rd., Cleveland 10, Ohio.  
Sundstrand Mch. Tool Co., 2531 11th St.,  
Rockford, Ill.

### TUBE FLANGING MACHINES

Grant Mfg. & Mch. Co., 90 Silliman St., Bridge-  
port 5, Conn.

### TUBE FORMING AND WELDING MACHINES

American Elec. Fusion Corp., 2606 Diversey  
Ave., W., Chicago, Ill.  
Yoder Co., 550 Walworth Ave., Cleveland.

### TUBE MILLS

Abbey-Etna Co., 2422 Maplewood Ave., Toledo  
10, Ohio.

### TUBING, Aluminum

Aluminum Co. of America, Oliver Bldg., Pitts-  
burgh, Pa.

### TUBING, Brass and Copper

Air Conversion Research Corp., 4107 N. Damen  
Ave., Chicago 18, Ill.  
American Brass Co., 25 Broadway, New York,  
N. Y.  
Chase Brass & Copper Co., Inc., 1949 Rodney  
St., Waterbury 20, Conn.  
Revere Copper & Brass Inc., 230 Park Ave.,  
New York, N. Y.

### TUBING, Flexible

Air Conversion Research Corp., 4107 N. Damen  
Ave., Chicago 18, Ill.  
American Metal Hose Br. American Brass Co.,  
25 Broadway, New York, N. Y.  
Titellex, Inc., 500 Frelinghuysen Ave., Newark  
5, N. J.

### TUBING, Steel

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.  
Bethlehem Steel Co., Bethlehem, Pa.  
Carpenter Steel Co., Reading, Pa.  
Jones & Laughlin Steel Corp., Gateway Center  
No. 3 Bldg., Pittsburgh, Pa.  
National Tube Div. U. S. Steel Corp., 525 Wm.  
Penn Place, Pittsburgh, Pa.  
Republic Steel Corp., Steel & Tubes Div., Re-  
public Bldg., Cleveland 1, Ohio.  
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St.,  
Chicago 18, Ill.  
Summerill Tubing Co., Div. Columbia Steel &  
Shafting Co., P. O. Box 1557, Pittsburgh  
30, Pa.  
Timken Roller Bearing Co., Canton, Ohio.

### TWIST DRILLS

See Drills, Twist.

### UNIVERSAL JOINTS

Baush Machine Tool Co., 156 Wesson Ave.,  
Springfield 7, Mass.  
Boston Gear Works, 3200 Main St., North  
Quincy 71, Mass.

### VALVE CONTROLS

Lehigh Foundries, Inc., 1500 Lehigh Dr.,  
Easton, Pa.  
Philadelphia Gear Works (Motorized), Erie Ave.  
and G St., Philadelphia, Pa.

### VALVES, Air

Bellows Co., 230 W. Market St., Akron, Ohio.  
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago,  
Ill.  
Hunt, C. B., & Son, Inc., 1911 E. Pershing St.,  
Salem, Ohio.  
Lehigh Foundries, Inc., 1500 Lehigh Dr.,  
Easton, Pa.  
Mead Specialties Co., 4114 North Knox Ave.,  
Chicago 41, Ill.  
National Pneumatic Co., Inc., 127 Armory St.,  
Boston 19, Mass.  
Rivett Lathe & Grinder, Inc., Brighton, Boston  
35, Mass.  
Ross Operating Valve Co., 120 E. Golden Gate,  
Detroit, Mich.

### VALVES, Hydraulic

American Steel Foundries, Elmes Engrg. Div.,  
Paddock Rd. and Tennessee Ave., Cincin-  
nati, Ohio  
Baldwin-Lima-Hamilton Corp., Philadelphia 42,  
Pa.  
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Alaska Aves., Detroit, Mich.  
Vickers, Inc., 1402 Oakman Blvd., Detroit,  
Mich.  
Watson-Stillman Co., Div. H. K. Porter Co.,  
Inc., Roselle, N. J.  
Wood, R. D. Co., Public Ledger Bldg., Phila-  
delphia 5, Pa.

### VIBRATION INSULATION

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Armstrong Bros. Tool Co., 5200 W. Armstrong  
Ave., Chicago, Ill.  
Bellows Co., 250 W. Market, Akron, Ohio.  
Brown & Sharpe Mfg. Co., Providence, R. I.  
Delta Power Tool Div., Rockwell Mfg. Co.,  
614G N. Lexington Ave., Pittsburgh 8, Pa.  
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago,  
Ill.  
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Homesfrank, Inc., Larchmont, N. Y.  
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L-W Chuck Co., 24 S. St. Clair, Toledo, Ohio.  
Martin, J. E., Mch. Works, 548 W. State St.,  
Springfield, Ohio.  
Producta Mch. Co., 990 Housatonic Ave.,  
Bridgeport, Conn.  
Skinner Chuck Co., 344 Church St., New Brit-  
ain, Conn.  
South Bend Lathe Works, Inc., 425 E. Madison  
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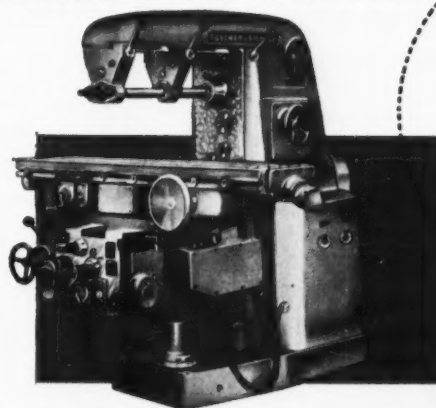
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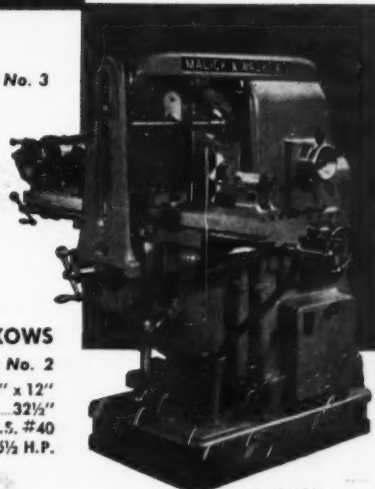
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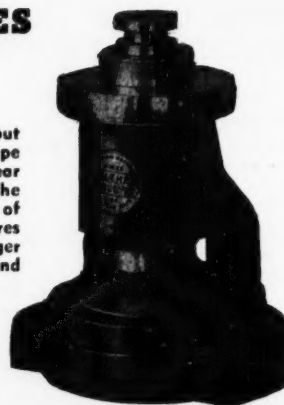
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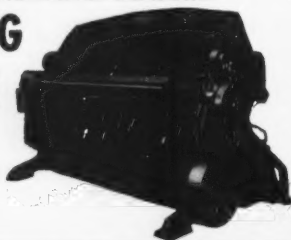
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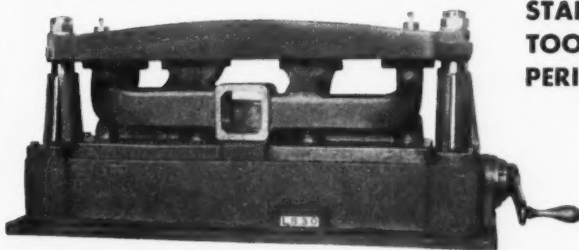
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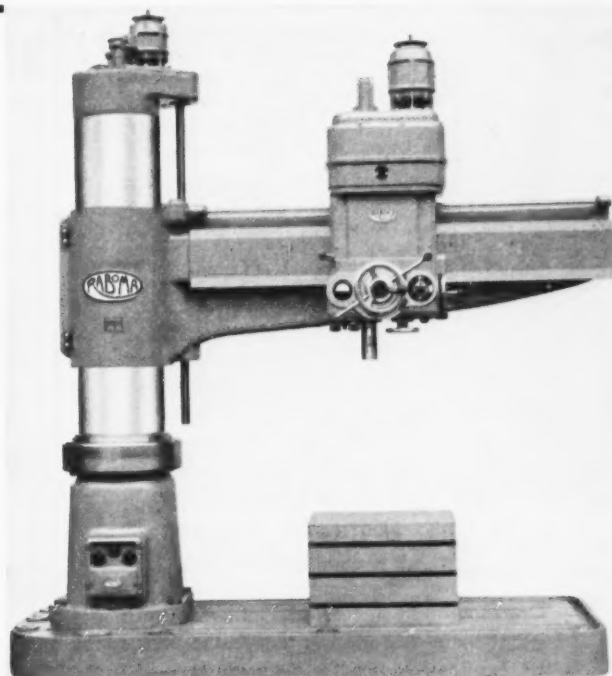
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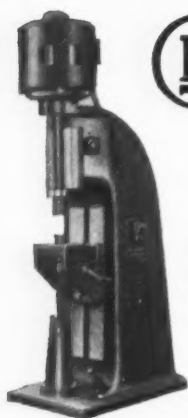


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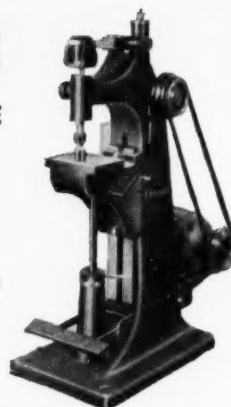
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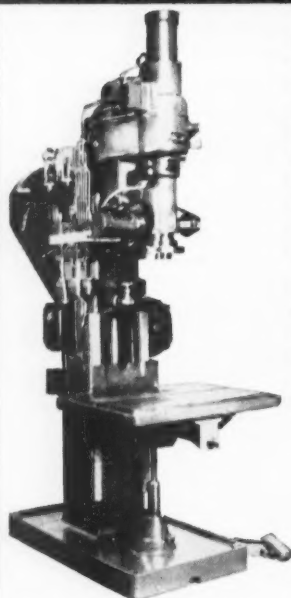
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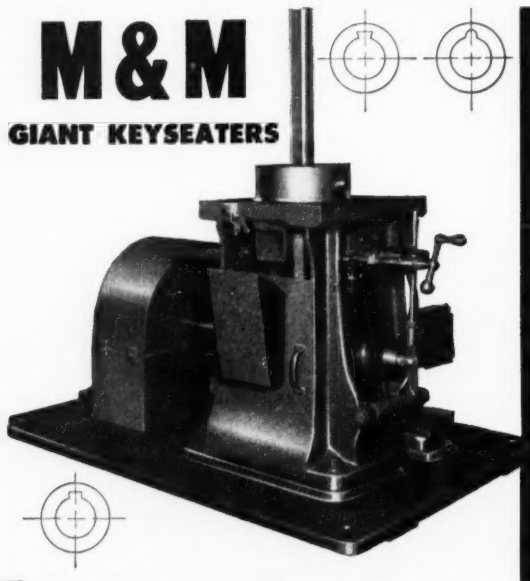
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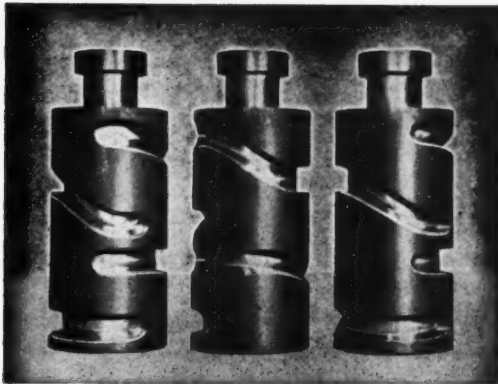


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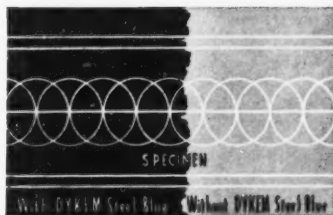
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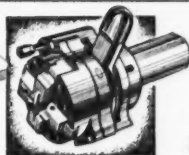
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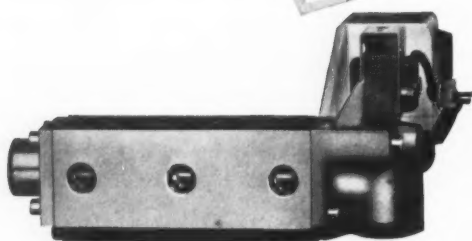
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MACHINERY, September, 1953—441



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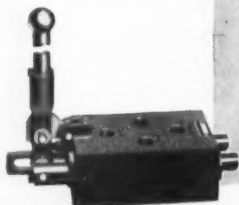


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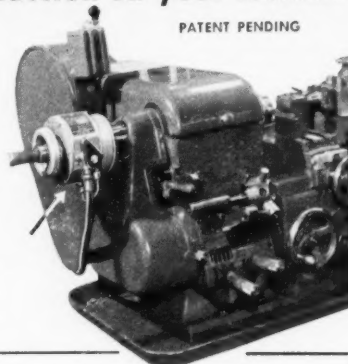
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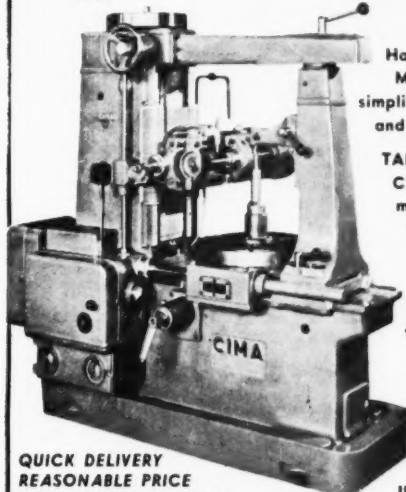
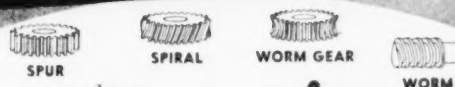
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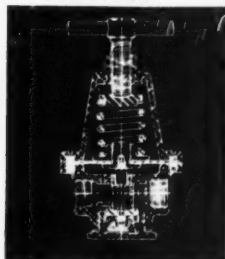
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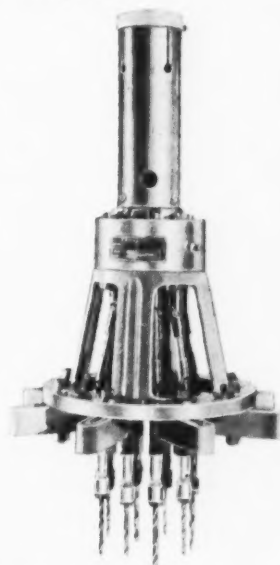
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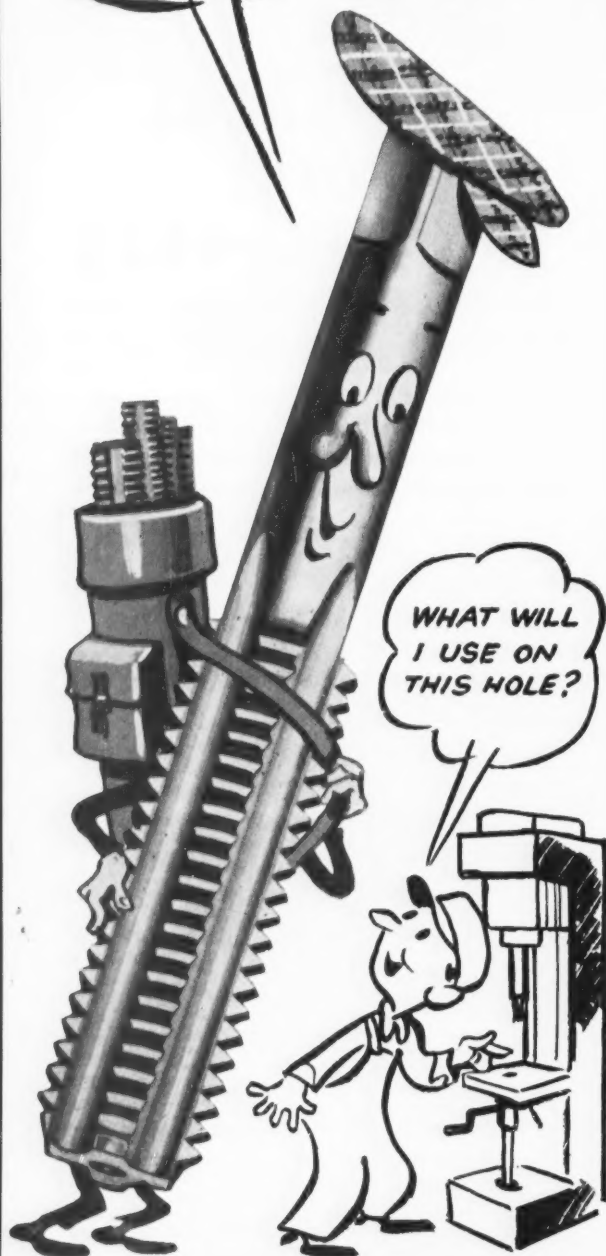
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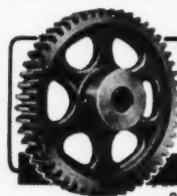
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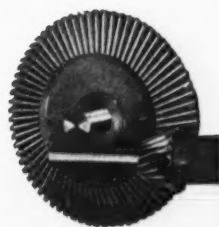
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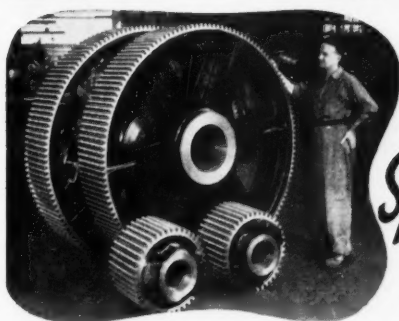
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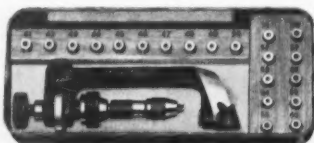
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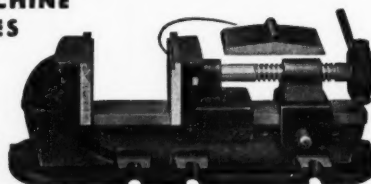
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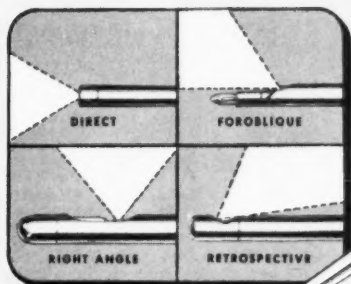
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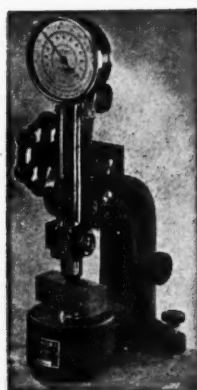
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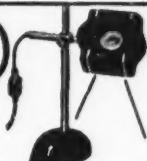
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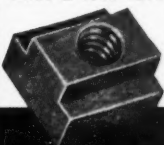
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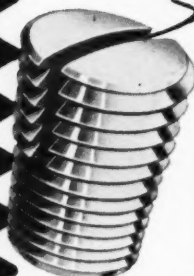
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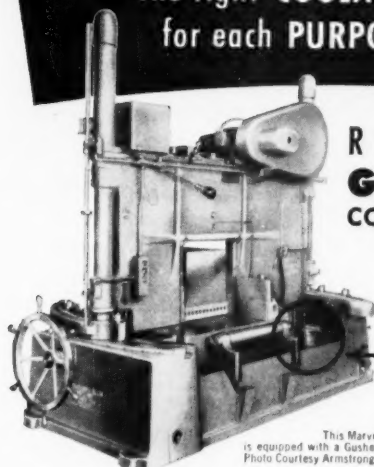
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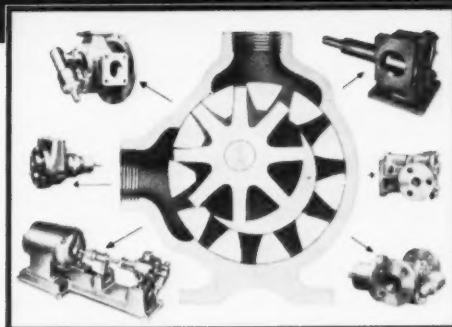
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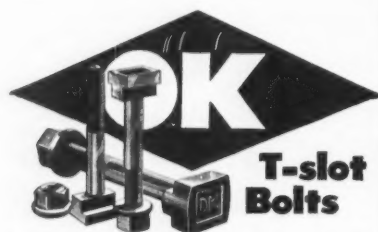
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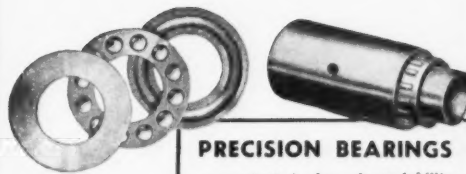
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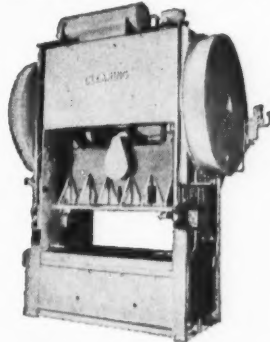
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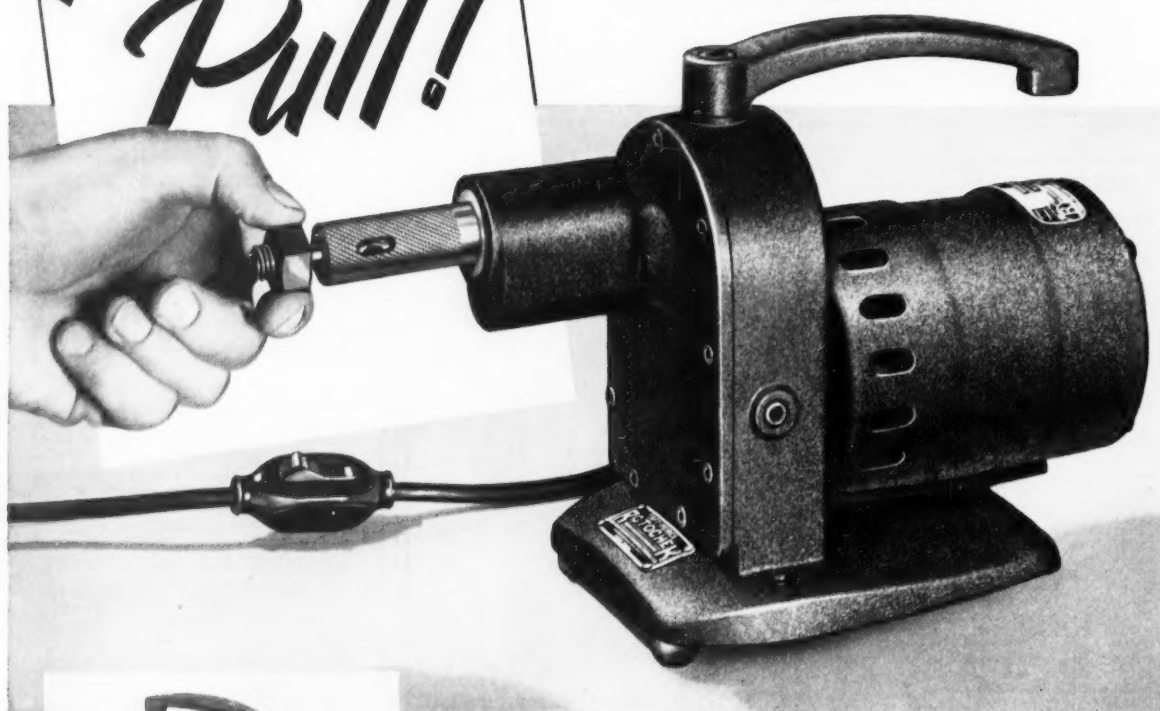
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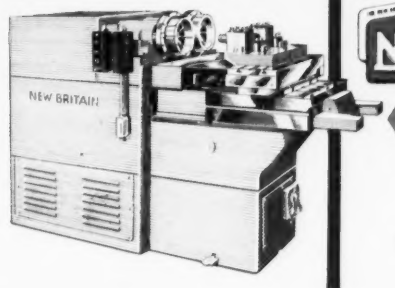
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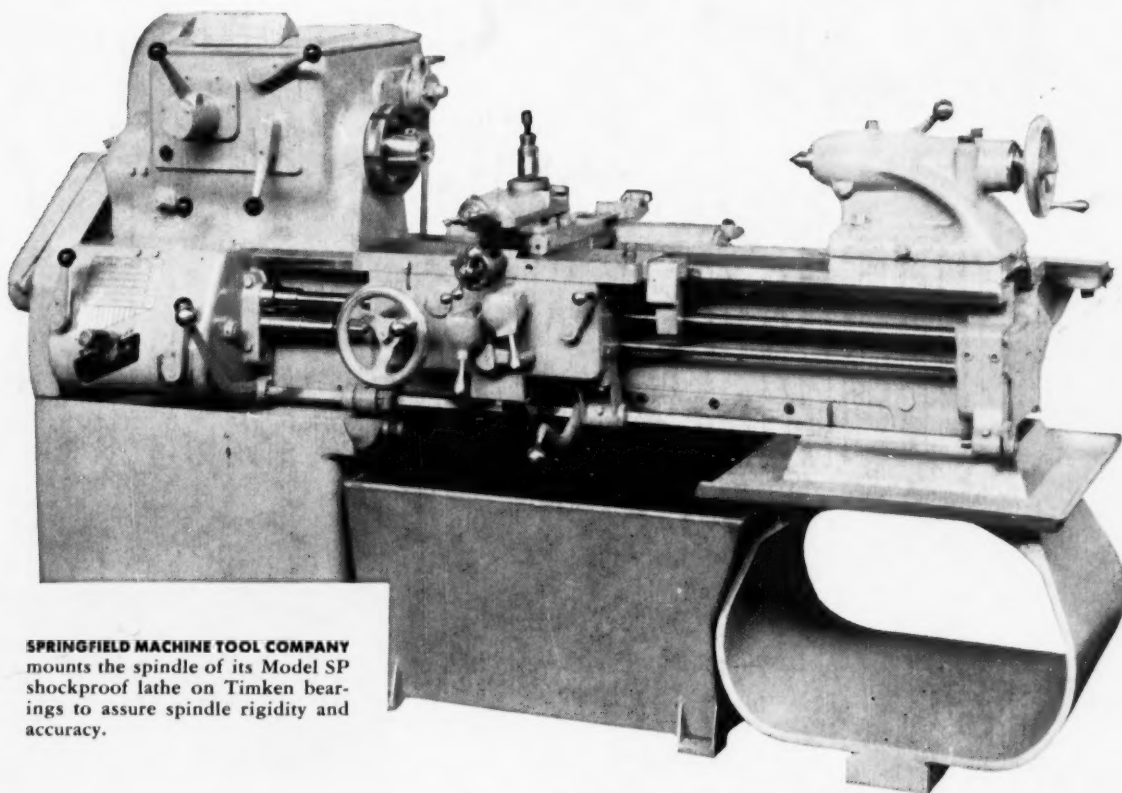
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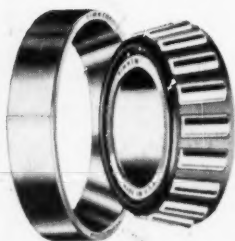
For the past 25 years, Timken precision bearings have been an important factor in the development of precision machine tools. Next time you buy or build a machine tool, be sure it's equipped with Timken precision tapered roller bearings. Always look for the trade-mark "Timken" stamped on every bearing. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian Plant: St. Thomas, Ont. Cable address: "TIMROSCO".



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